TECHNICAL MANUAL 2013

SPLIT MONO DC INVERTER

MODELS

BDS28A

BDS35A

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MAXA AIR CONDITIONING

1. SPECIFICATIONS

Models of indoor units					BDS28A	BDS35A
Rated voltage					220-240V ~50Hz	
Cooling		Total capacity		kW	2,5(0,7 ~ 4,4)	3,5(0,7 ~ 4,5)
				Btu/h	8,53(2,3 ~ 15,00)	11,9(2,3 ~ 15,3)
		Power input		W	520	900
		Rated current		A	2,3	4,0
		S.E.E.R.		W/W	7,5-A++	7-A++
Heating		Total capacity		kW	2,7(0,7 ~ 4,8)	3,5(0,7 ~ 5,5)
				Btu/h	9,3(2,4 ~ 16,3)	12,4(2,4 ~ 18,7)
		Power input		W	565	895
		Rated current		A	2,37	7,5
		S.C.O.P.		W/W	4,6 – A++	4,6 – A++
Indoor unit	Air flow volume (SH/H/MH/M/ML/L/SL)			m^3/h	730/670/610/530/460/410/380	770/670/610/530/460/410/380
	Dehumidifying volume			l/h	0,8	1,4
	Fan motor cooling speed (Max - Min)			r/min	1300/1050/1000/900/800/700/500	1350/1070/1000/900/800/700/500
	Fan motor heating speed (Max - Min)			r/min	1300/1150/1080/1030/980/900/850	1350/1150/1080/1030/980/900/850
	Output of fan motor			W	15	15
	Fan motor capacitor			µF	/	/
	Fan motor RLA			A	0,07	0,07
	Fan type - piece				Cross flow - 1	Cross flow - 1
	Diameter x length			mm	Φ98 x 662	Φ98 x 662
	Evaporator	Evaporator type			Aluminium Fin-copper Tube	
		Pipe diameter		mm	Φ7	Φ7
		Row-fin gap		mm	2-1.5	2-1,5
		Coil length x height x width (l x H x L)		mm	662 x 25,4 x 305	662 x 25,4 x 305
	Swing motor model				MP24HA/MP24HB/MP24HC	MP24HA/MP24HB/MP24HC
	Output of swing motor			W	2,4	2,4
	Fuse			A	3,15	3,15
	Sound pressure level			dBA	36/32/21	36/32/21
	Sound power level			dBA	46/42/31	46/42/31
	Dimension (W/H/D)			mm	866 x 292 x 209	866 x 292 x 209
	Dimension of package (W/H/D)			mm	945 x 377 x 297	945 x 377 x 297
	Net weight/gross weight			kg	11/14	11/14
Models of outdoor units					**BDS28A**	**BDS35A**
Outdoor unit	Compressor manufacturer/trademark				SANYO	
	Compressor model				C-6RZ110H1A	C-6RZ110H1A
	Compressor oil				FV50S	FVC 68D / RB 68EP
	Compressor type				ROTARY	ROTARY
	L.R.A.			A	33,00	33,00
	Compressor RLA			A	4,59	4,59
	Compressor power input			W	800	800
	Overload protector				1NT11L-3979	1NT11L-3979
	Throttling method				Electronic expansion valve	
	Starting method				16°C ~ 30°C	
	Working temperature range (°C)				-20°C ~ 48°C	
	Condenser	Condensor type			Aluminium Fin-copper Tube	
		Pipe diameter		mm	Φ7,94	Φ7,94
		Rows-fin gap		mm	2,5-1,5	2,5-1,5
		Coil length (l) x height (H) x width (L)		mm	763 x 57 x 550	730 x 38.1 x 508
	Fan motor speed			rpm	850/750/600	850/750/600
	Output fan motor			W	40	40
	Fan motor RLA			A	0,23	0,23

	Fan motor capacitor		μF	/	/
	Air flow volume of outdoor unit		m³/h	2000	2000
	Fan type-piece			Axial-flow	
	Fan diameter		mm	Φ445	Φ445
	Defrosting method			Automatic Defrosting	
	Climate type			T1	T1
	Isolation			I	I
	Moisture protection			IP24	IP24
	Permissible excessive operating pressure for the discharge side		Mpa	3,8	3,8
	Permissible excessive operating pressure for the suction side		Mpa	1,2	1,5
	Sound pressure level		dB(A)	49/-/-	50/-/-
	Sound power level		dB(A)	59/-/-	60/-/-
	Dimensions (WXHXD)		mm	906 x 596 x 378	906 x 596 x 378
	Dimension of package (L/W/H)		mm	948 x 420 x 645	348 x 420 x 645
	Net weight/gross weight		kg	43/47	43/47
	Refrigerant charge (R410A)		kg	1,3	1,3
Connecting pipe	Length		m	5	5
	Gas additional charge		g/m	20	20
	Outer diameter	Liquid pipe	mm	Φ6	Φ6
		Gas pipe	mm	Φ9,52	Φ9,52
	Max distance	Height	m	10	10
		Length	m	15	20

The above data of specifications are subject to change without prior notice. Please refer to the actual data specified on the nameplate of the unit.

Note: Test conditions:

Standard condition	Indoor side state		Outdoor side state	
	Dry bulb temp. °C	Wet bulb temp. °C	Dry bulb temp. °C	Wet bulb temp. °C
Rated cooling	27	19	35	24
Rated heating	20	15	7	6

3) Microphone at a distance of 1m from the unit.

Approximate calculation from Sound Pressure Level to Sound Power Level:

- Average Sound Pressure Level $\overline{L}_p$ =10*lg$\left[1/2*(10^{0.1*L_{P1}}+10^{0.1*L_{P2}}\right]$.

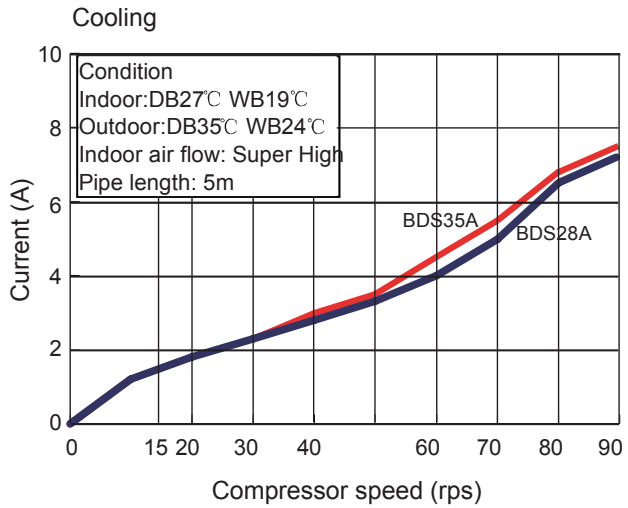
L_{P1} : Sound pressure level of front test point.

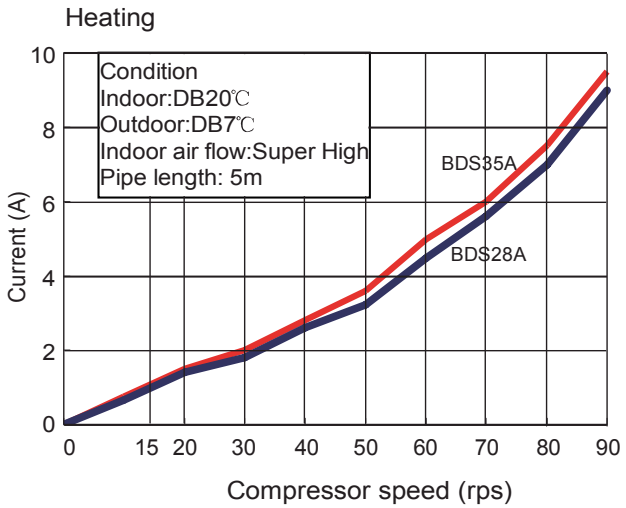
L_{P2} : Sound pressure level of side test point for indoor unit L_{P1} , L_{P2} .

- Approximate Sound Power Lever $\overline{L}_W$ = $\overline{L}_p$ +10.

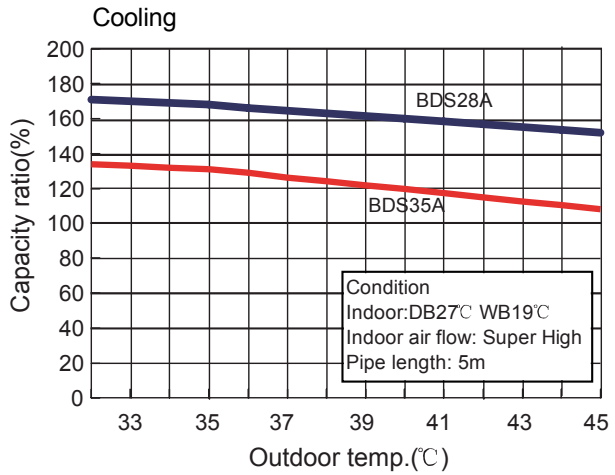
2. CHARACTERISTICS DATA

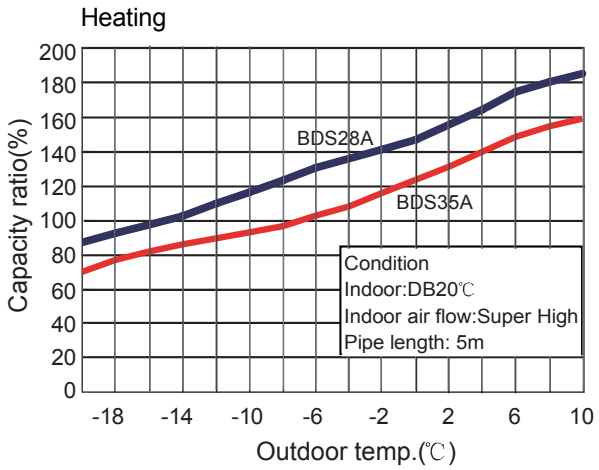
2.1 Operation characteristic curve



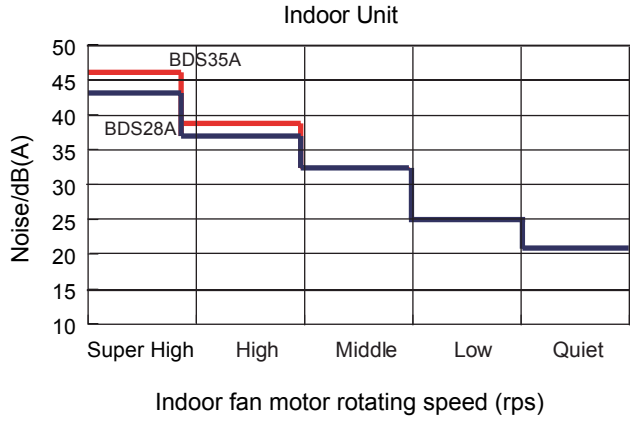


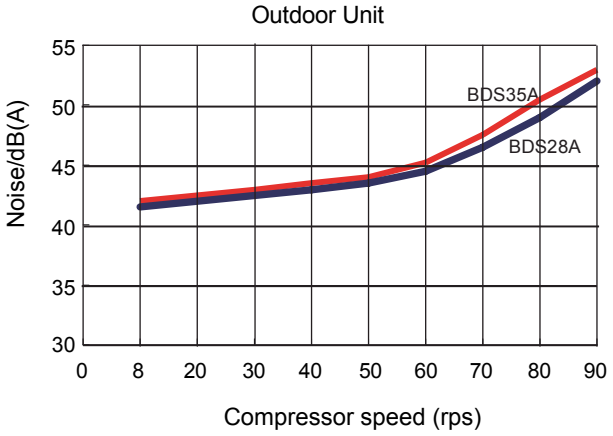
2.2 Capacity variation ratio according to temperature





2.3 Noise criteria curve





2.4 Operation data

Cooling:

Temperature conditions (°C)		Model name	Standard pressure	Heat exchanger pipe temp.		Indoor fan speed	Outdoor fan speed	Compressor revolution (rps)
Indoor	Outdoor		P(MPa)	T1 (°C)	T2 (°C)			
27/19	35/24	BDS28A	0,9~1,2	In: 12~14 Out: 10~12	In: 41~43 Out: 43~45	Super high	Super High	34
		BDS35A						55

Heating:

Temperature conditions (°C)		Model name	Standard pressure	Heat exchanger pipe temp.		Indoor fan speed	Outdoor fan speed	Compressor revolution (rps)
Indoor	Outdoor		P(MPa)	T1 (°C)	T2 (°C)			
20/15	7/6	BDS28A	2,0~2,6	In: 33~35 Out: 42~44	In: 3~5 Out: 3~5	Super high	Super high	41
		BDS35A						55

Notes:

(1) Connecting piping condition: 5m.

(2) T1: Outlet and inlet pipe temperature of evaporator.

T2: Outlet and inlet pipe temperature of condenser.

P: Pressure of air pipe used for connecting outdoor and indoor units.

Notes:

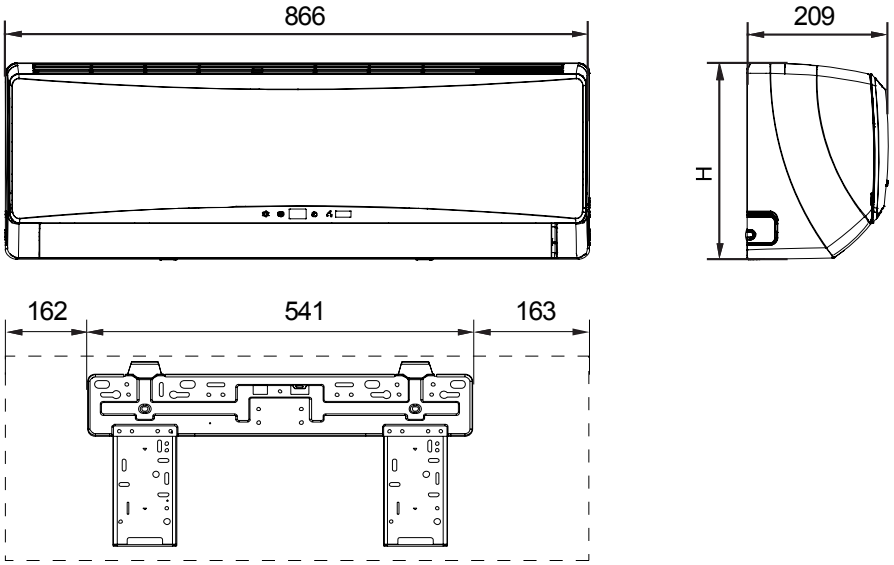
(1) Measure surface temperature of heat exchanger pipe around center of heat exchanger path U bent.

(Thermistor thermometer)

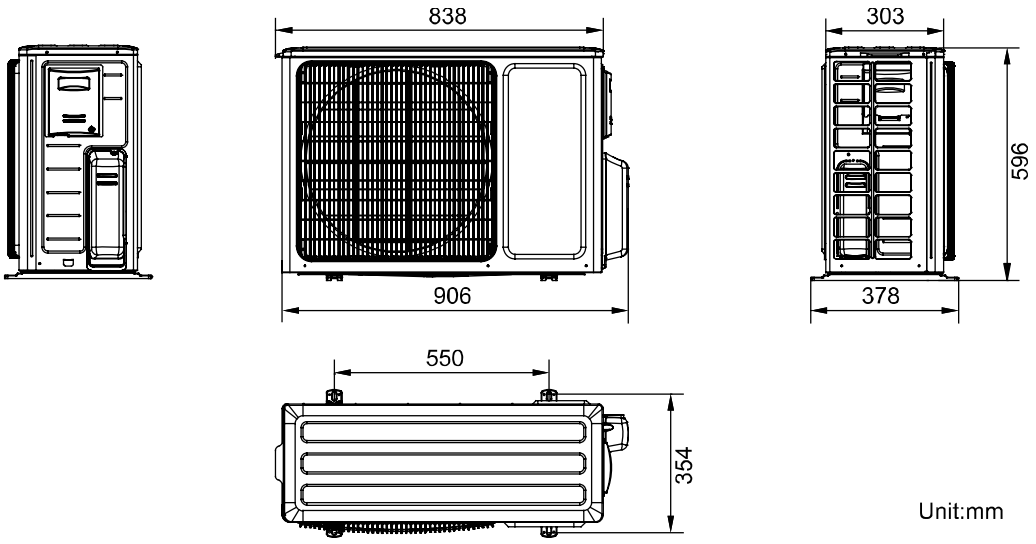
(2) Connecting piping condition: 5m.

3. DIMENSIONS

3.1 Indoor units

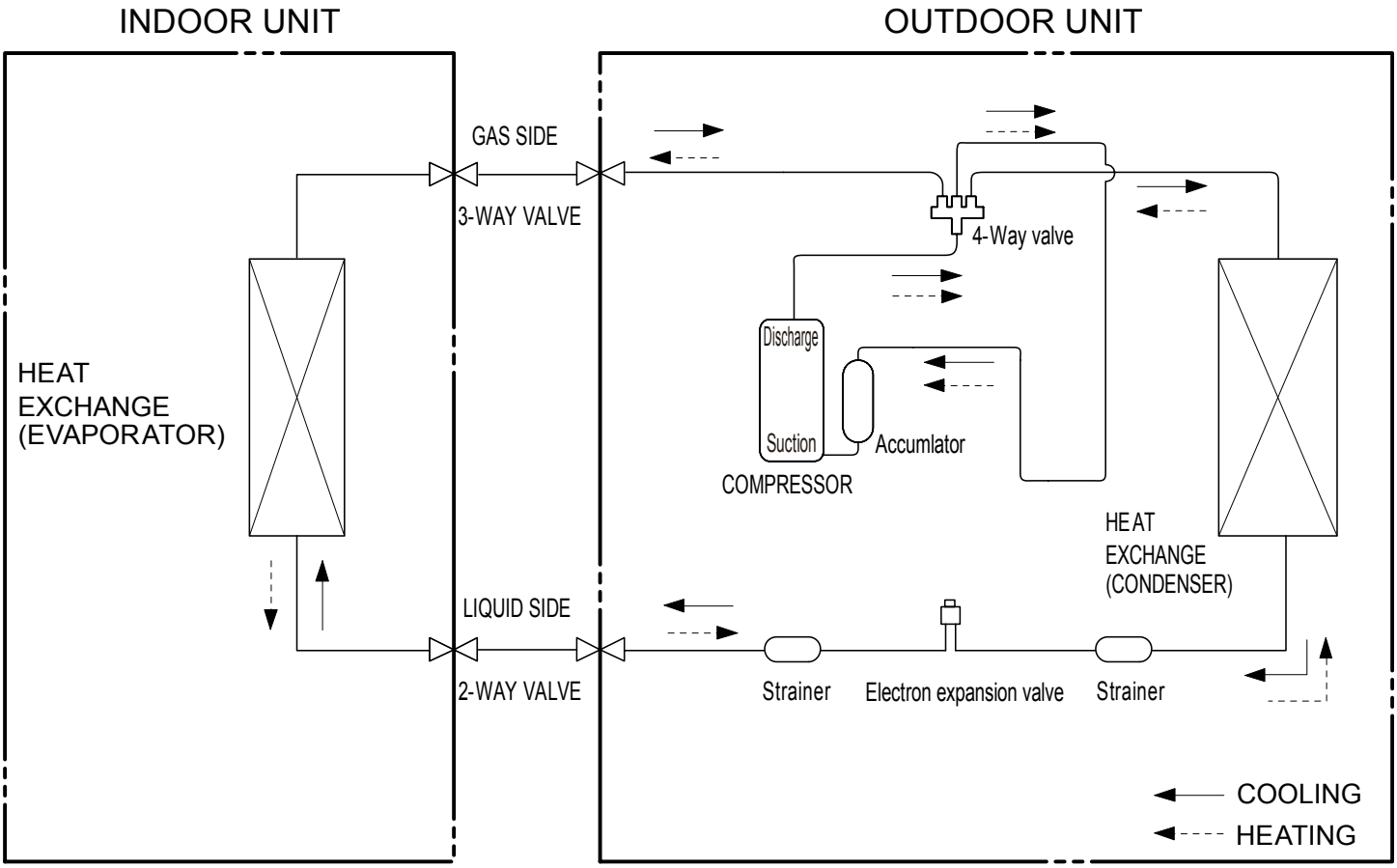


3.2 Outdoor units



Unit:mm

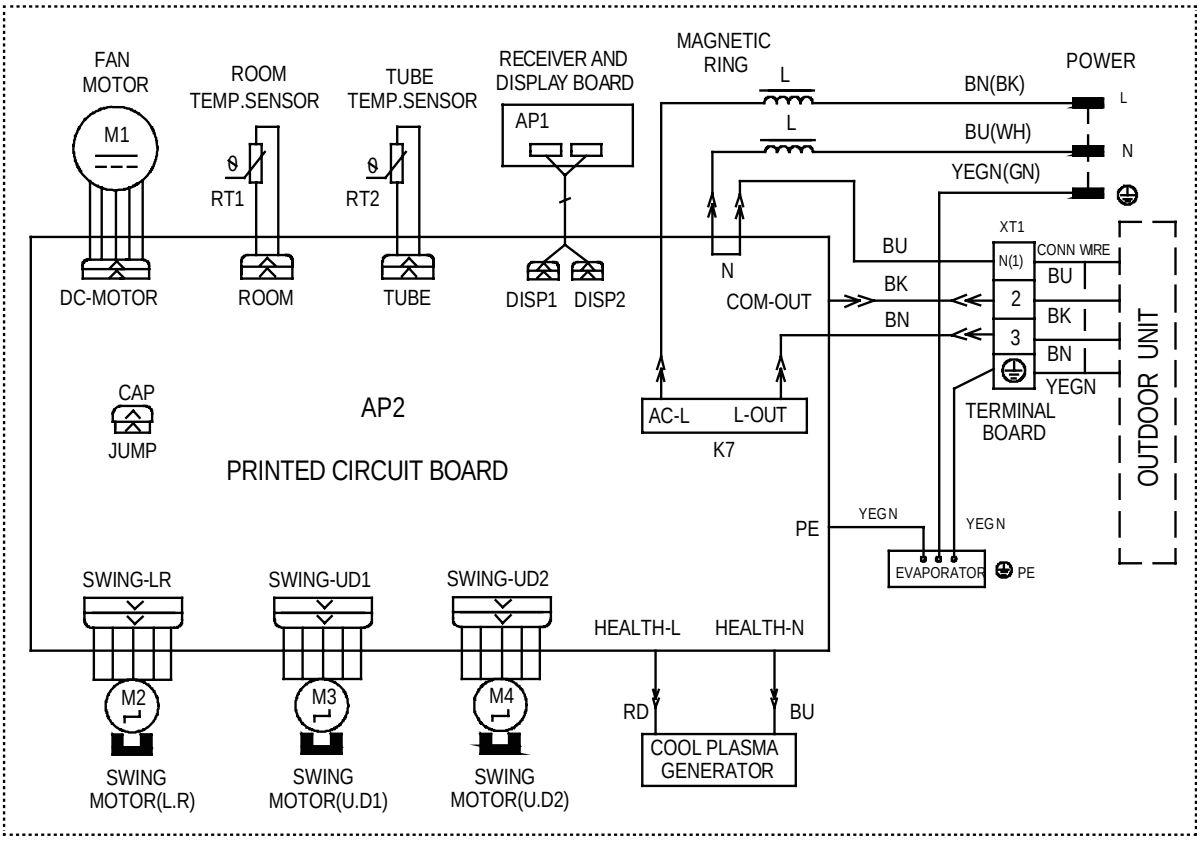
4. REFRIGERANT DIAGRAM



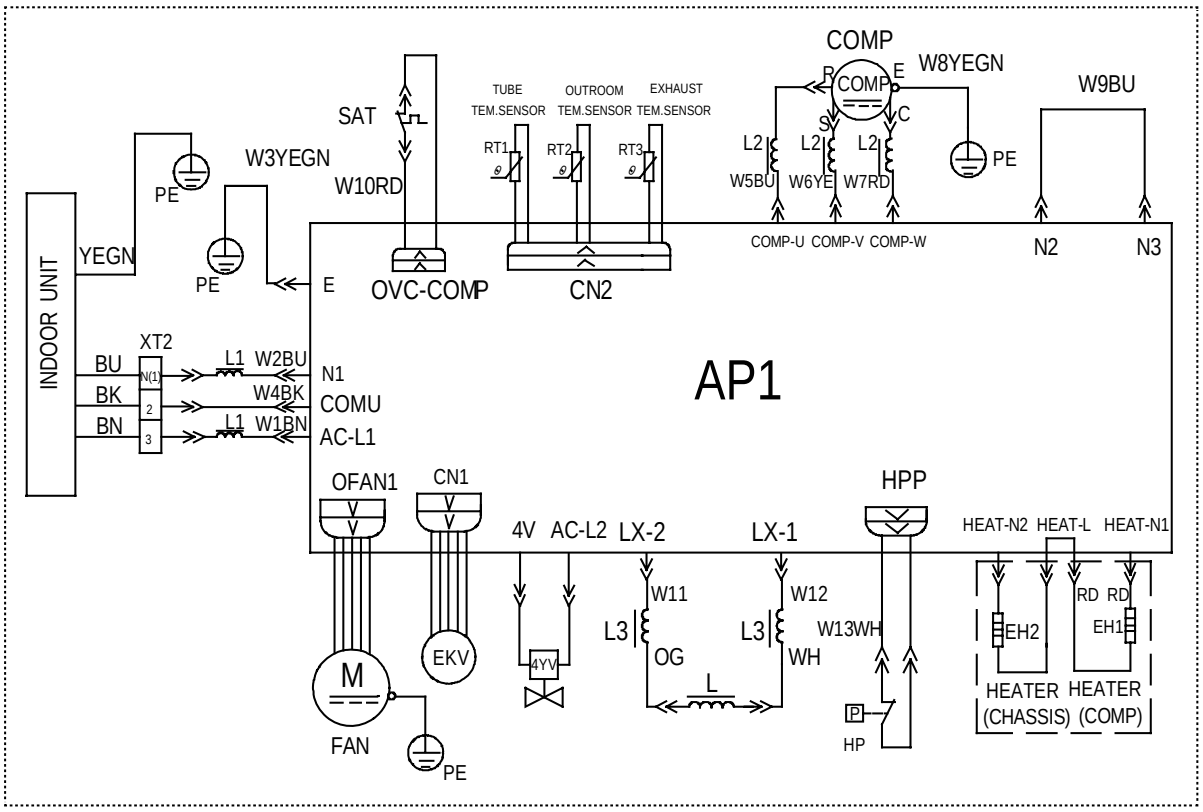
Refrigerant pipe diameter
Liquid : 1/4" (6mm)
Gas : 3/8" (9.52mm)

5. ELECTRICAL CIRCUIT DIAGRAM

5.1 Indoor units: BDS28A, BDS35A

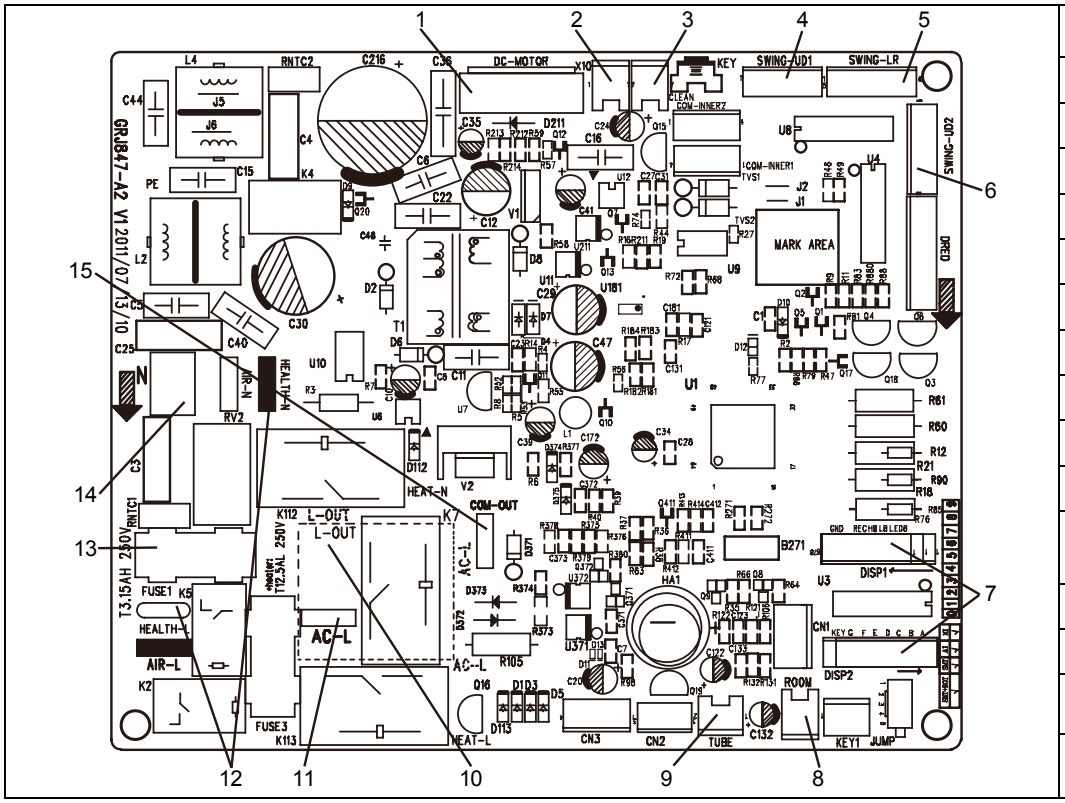


5.2 Outdoor units: BDS28A, BDS35A



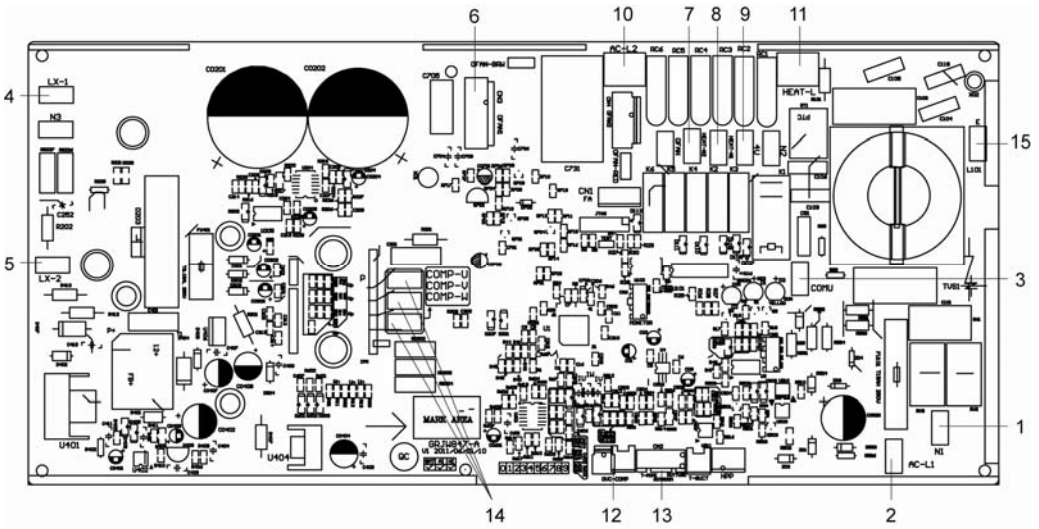
6. PRINTED CIRCUIT BOARD

6.1 Indoor unit: BDS28A, BDS35A



No	Part name
1	DC fan
2	Microswitch
3	Electrostatic precipitation
4	Small up & down swing interface
5	Left and right
6	Big up & down swing interface
7	Display interface
8	Ambient temperature sensor
9	Tube temperature sensor
10	Outdoor unit live wire
11	Input interface of live wire for indoor unit
12	Health
13	Fuse
14	Interface of neutral wire for indoor and outdoor units
15	Communication interface of indoor and outdoor units

6.2 Outdoor units: BDS28A, BDS35A



No	Part name
1	Input of neutral wire of power
2	Input of live wire of power
3	Communication interface
4	Interface 1 of electric reactor
5	Interface 2 of electric reactor
6	Interface of fan
7	Neutral wire of electric heater of chassis
8	Neutral electric wire of compressor
9	Neutral wire of 4-way valve
10	Live wire of 4-way valve
11	Live wire of electric heater
12	Input of overload
13	Temperature sensor
14	U, V, W three phases of compressor
15	Input of ground wire of power

7. Control functions

7.1. Temperature Parameters

- Indoor preset temperature (T_{preset})
- Indoor ambient temperature (T_{amb})

7.2. Basic functions

Once energized, the compressor should in no way be restarted unless after at least 3-minute time interval. In case of having memory function, for the first energization, the compressor will be started without 3-minute lag, if being under the condition of power-off, and the compressor will have 3-minutes delay to be started under the condition of power-on. Once started, the compressor will not be stopped within 6 minutes with the changes of room temperature.

7.2.1 Cooling Mode

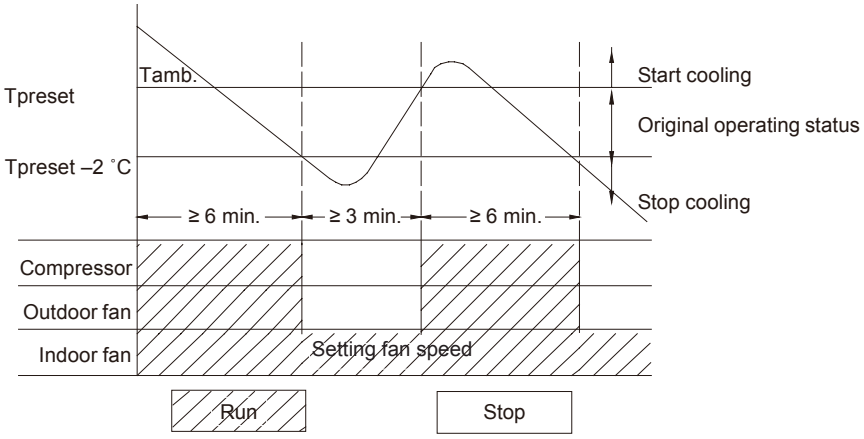
❶ Cooling Condition and Process

When $T_{amb.} \geq T_{preset}$, the unit will run under cooling mode, in which case the compressor and outdoor fan will be started, and the indoor fan will run at preset speed.

When $T_{amb.} \leq T_{preset}$ -3°C, the compressor will stop, the outdoor fan will stop with time lag of 30s, and the indoor fan will run at preset speed.

When T_{preset} -3°C <$T_{amb.}$ < T_{preset} , the unit will maintain its original operating status.

■ Under this mode, the switchover (reversal) valve will be de-energized and the temperature can be set from 16°C to 30°C. If the compressor is shut down for some reason, the indoor fan and the swing device will operate at the original state.



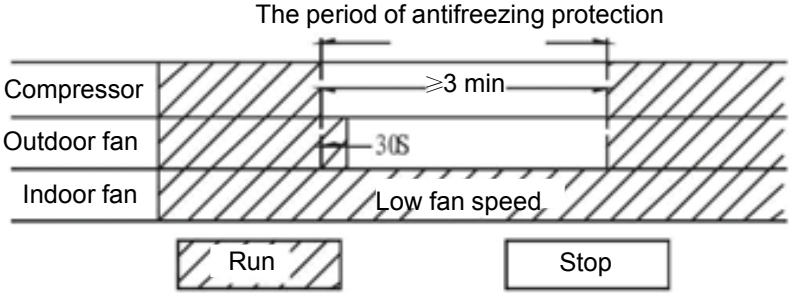
❷ Protection function

♦ Overcurrent protection

If total current is high, the compressor will run in limited frequency. If total current is too high, the compressor will stop, the outdoor fan will delay 30 seconds to stop, indoor unit will display **E5** and outdoor yellow light will blink 5 times.

♦ Antifreeze protection

When the antifreeze protection is detected, the compressor will stop, the outdoor fan will stop after 30 seconds, and the indoor fan and swing motor will keep running in the original mode. When antifreeze protection is eliminated and the compressor has stopped for 3 minutes, the compressor will resume running in the original mode.



7.2.2 Dehumidifying mode

7.2.2.1 The condition and process of dehumidifying

If $T_{amb.} > T_{preset}$, DRY mode will act, the indoor fan, outdoor fan and compressor will run, and indoor fan will run at low speed.

If $T_{set} - 2°C \leq T_{ambient} \leq T_{preset}$, the unit will keep running in the original mode.

If $T_{am.} \leq T_{set} - 2°C$, the compressor will stop running, the outdoor fan will delay 30 seconds to stop and the indoor fan will run at low speed.

7.2.2.2 Protection function

Protection is the same as that under COOL mode.

7.2.3 HEAT mode

7.2.3.1 The condition and process of heating

If $T_{amb} \leq T_{prset} + 2°C$, HEAT mode will act, the compressor, outdoor fan and reversal valve will run, the indoor fan will delay 3min to stop at the latest.

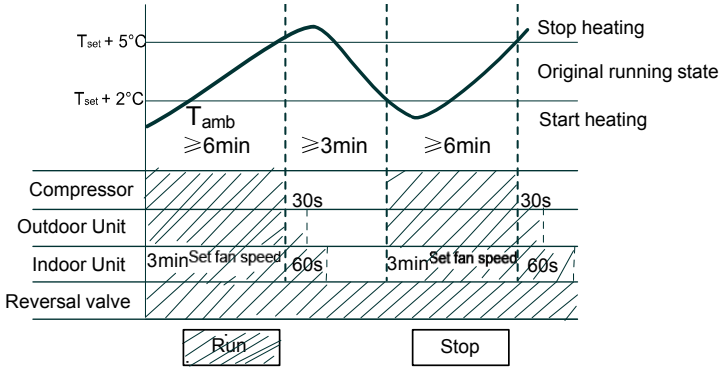
If $T_{prset} + 2°C < T_{amb} < T_{prset} + 5°C$, the unit will keep running in the original mode.

If $T_{amb} > T_{prset} + 5°C$, the compressor will stop, the outdoor fan will delay 30 sec to stop and Indoor unit fan blow with low speed for 60s,during this period, fan speed is not changeable.

● In this mode, the temperature setting range is 16°C ~ 30°C.

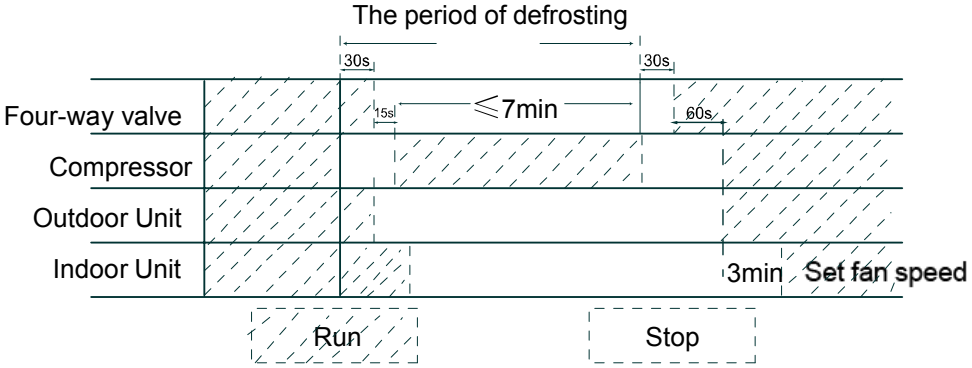
The air conditioner will adjust the running frequency of the compressor automatically according to the change of ambient temperature.

● When the unit is turned off in HEAT mode, or switched to other mode from HEAT mode, the four –way valve will be powered off after the compressor stops.



7.2.3.2 The condition and process of defrosting

When frost is detected in the condenser, the system will enter into defrosting state. When defrosting starts, the compressor and indoor fan will stop, and the outdoor fan and four-way valve will delay 30 seconds to stop. The compressor will start after 15 seconds and then defrosting will be started. When the compressor has run for 7 minutes or defrosting is finished, the compressor will stop. After 30 seconds the four – way valve opens and after an other 60 seconds, the compressor and outdoor fan resume running. The indoor fan will delay 3 minutes to run at the la test and temperature on the display panel shows **H1**.



7.2.3.3 Protection function

♦ Anti-cold – wind protection

In HEAT mode, in order to prevent the indoor unit from blowing out cold wind, each time the compressor starts, the indoor fan will delay 3 minutes after the compressor to run at the latest and it can adjust fan speed automatically when temperature is low.

♦ Overcurrent protection

Overcurrent protection is the same with that in COOL mode.

❸ Protection

♦ Cold air prevention

The unit is started under heating mode (the compressor is ON):

① In the case of $T_{indoor\ amb.} < 24°C$: if $T_{tube} \leq 40°C$ and the indoor fan is at stop state, the indoor fan will begin to run at low speed with a time lag of 2 minutes. Within 2 minutes, if $T_{tube} > 40°C$, the indoor fan also will run at low speed; and after 1-minute operation at low speed, the indoor fan will be converted to operation at preset speed. Within 1-minute low speed operation or 2-minute non-operation, if $T_{tube} > 42°C$, the fan will run at present speed.

② In the case of $T_{indoor\ amb.} \geq 24°C$: if $T_{tube} > 42°C$, the indoor fan will run at low speed, and after one minute, the indoor fan will be converted to preset speed. Within one-minute low speed operation, if $T_{tube} > 42°C$, the indoor fan will be converted to preset speed.

Note: $T_{indoor\ amb.}$ indicated in ① and ② refers to, under initially heating mode, the indoor ambient temperature before the command to start the compressor is performed according to the program, or after the unit is withdrawn from defrost, the indoor ambient temperature before the defrost symbol is cleared.

♦ Total current up and frequency down protection

If the total current $I_{total} \leq W$, frequency rise will be allowed; if $I_{total} \geq X$, frequency rise will not be allowed; if $I_{total} \geq Y$, the compressor will run at reduced frequency; and if $I_{total} \geq Z$, the compressor will stop and the outdoor fan will stop with a time lag of 30s.

7.2.4 Fan Mode

Under the mode, the indoor fan will run at preset speed and the compressor, the outdoor fan, the four-way valve and the electric heater will stop.

7.2.5 AUTO Mode

① Working conditions and process of AUTO mode

Under AUTO mode, standard cooling temperature T_{set} is 25°C and standard heating temperature T_{set} is 20°C.

a) Once energized, if $T_{amb.} \leq 22°C$, the unit will be started under heating mode; if $23°C < T_{amb.} < 25°C$, the unit will run under fan mode and the run indicator will be bright; and if $T_{amb.} \geq 25°C$, the unit will be started under cooling mode.

b) Under AUTO mode, if $T_{amb.} \geq T_{set}$ is detected, the unit will select to run under cooling mode, in which case implicit set temperature is 25°C; if $T_{amb.} \leq T_{preset} - 2°C$, the compressor will stop, the outdoor fan will stop with a time lag of 1 minute, and the indoor fan will run at set speed; and if $T_{set} - 2°C < T_{amb.} < T_{set}$, the unit will remain at its original state.

c) Under AUTO mode, if $T_{amb.} \leq T_{set} + 2°C$ is detected, the unit will select to run under heating mode, in which case implicit preset temperature is 20°C; if $T_{amb.} \geq T_{set} + 5°C$, the compressor will stop, the outdoor fan will stop with a time lag of 1 minute, and the indoor fan will run under the mode of residue heat blowing; and if $T_{set} + 2°C < T_{amb.} < T_{set} + 5°C$, the unit will remain at its original state.

d) Under AUTO mode, if $23°C < T_{amb.} < 25°C$, the unit will remain at its original state.

② Protection

a) In cooling operation, protection is the same as that under the cooling mode;

b) In heating operation, protection is the same as that under the heating mode;

c) When ambient temperature changes, operation mode will be converted preferentially. Once started, the compressor will remain unchanged for at least 6 minutes.

7.2.6 Common Protection Functions and Fault Display under COOL, HEAT, DRY and AUTO Modes

① Overload protection

T_{tube}: measured temperature of outdoor heat exchanger under cooling mode; and measured temperature of indoor heat exchanger under heating mode.

1) Cooling overload

a) If $T_{tube} \leq 52°C$, the unit will return to its original operation state.

b) If $T_{tube} \geq 55°C$, frequency rise is not allowed.

c) If $T_{tube} \geq 58°C$, the compressor will run at reduced frequency.

d) If $T_{tube} \geq 62$ °C, the compressor will stop and the indoor fan will run at preset speed.

2) Heating overload

a) If $T_{tube} \leq 50°C$, the unit will return to its original operation state.

b) If $T_{tube} \geq 53°C$, frequency rise is not allowed.

c) If $T_{tube} \geq 56°C$, the compressor will run at reduced frequency.

d) If $T_{tube} \geq 60°C$, the compressor will stop and the indoor fan will blow residue heat and then stop.

② Exhaust temperature protection of compressor

If exhaust temperature ≥98°C, frequency is not allowed to rise.

If exhaust temperature ≥103°C, the compressor will run at reduced frequency.

If exhaust temperature ≥110°C, the compressor will stop.

If exhaust temperature ≤90°C and the compressor has stayed at stop for at least 3 minutes, the compressor will resume its operation.

③ Communication fault

If the unit fails to receive correct signals for durative 3 minutes, communication fault can be justified and the whole system will stop and the display will show the error code **E6**.

④ Module protection

Under module protection mode, the compressor will stop. When the compressor remains at stop for at least 3 minutes, the compressor will resume its operation. If module protection occurs six times in succession, the compressor will not be started again.

⑤ Overload protection

If temperature sensed by the overload sensor is over 115°C, the compressor will stop and the outdoor fan will stop with a time lag of 30 seconds. If temperature is below 95°C, the overload protection will be relieved.

⑥ If voltage on the DC bus is below 150V or over 420V

If voltage on the DC bus is below 150V or over 420V, the compressor will stop and the outdoor fan will stop with a time lag of 30 seconds. When voltage on the DC bus returns to its normal value and the compressor has stayed at stop for at least 3 minutes, the compressor will resume its operation.

⑦ Faults of temperature sensors

Designation of sensors	Faults
Indoor ambient temperature	The sensor is detected to be open-circuited or short-circuited for successive 30 seconds.
Indoor tube temperature	The sensor is detected to be open-circuited or short-circuited for successive 30 seconds.
Outdoor ambient temperature	The sensor is detected to be open-circuited or short-circuited for successive 30 seconds.
Outdoor tube temperature	The sensor is detected to be open-circuited or short-circuited for successive 30 seconds, and no detection is performed within 10 minutes after defrost begins.
Exhaust	After the compressor has operated for 3 minutes, the sensor is detected to be open-circuited or short-circuited for successive 30 seconds.
Overload	After the compressor has operated for 3 minutes, the sensor is detected to be open-circuited or short-circuited for successive 30 seconds.

⑧ Power-failure memory protection

Memory content: mode, up-down purging, lighting, set temperature, and set fan speed. After having power failure, it can automatically start operating according to the memory content after being powered on again. If no timing function is set in the final remote control order, the system will memorize the latest remote control order and then operate based on the manner set during the latest time. There is common timing function included in the latest remote control order. If the system has power failure when the timed time is still not reached, the system will memorize the timing function in the latest remote control order after being powered on again, and the timing time will be calculated from the power-on time again. If there is timing function in the latest remote control order, when the timed time is reached and there is power-failure after the system conduct the action of the set timed start or timed stop, then after powered on again, the system will memorize the operating condition before power failure and will not implement the timing action, and also the moment timing will not be memorized.

8. TROUBLESHOOTING

8.1 Malfunction diagnosis should be performed as below procedure

Step	Malfunction diagnosis procedure
1	Conform malfunction
2	Read out the error code for indoor/outdoor unit and then find out the corresponding malfunction name
3	Troubleshooting and maintenance (refer to the content as below for details)

Note: There's high capacity electrolytic capacitor on outdoor unit's main board. Therefore, there's still high voltage (DC 280V-380V, which is depending on the input voltage) in the capacitor even if the power is disconnected.

That voltage can only be decreased to the safety valve after more than 20mins. There will be electric shock if you touch the electrolytic capacitor within 20mins. Therefore, if it needs to maintain it after disconnecting the power, you must discharge the electrolytic capacitor according to below method.

8.2 Confirmation

(1) Confirmation of Power Supply

Confirm that the power breaker operates (ON) normally;

(2) Confirmation of Power Voltage

Confirm that power voltage is AC 220–230–240 ±10%. If power voltage is not in this range, the unit may not operate normally.

8.3 Flashing LED of Indoor/Outdoor unit and primary judgement

No	Malfunction	Display Method of Indoor Unit				Display Method of Outdoor Unit Indicator has 3 kinds of display status and they will be displayed circularly every 5s.			A/C status	Possible causes
		LED 88	Indicator Display (during blinking, ON 0.5s and OFF 0.5s)							
			Operation Indicator ⏻	COOL Indicator ❄	Heating Indicator ☼	Yellow Indicator	Red Indicator	Green Indicator		
1	High pressure protection of system	**E1**	Blinks once						- During cooling and drying operation, except indoor fan operates, all loads stop operation. - During heating operation, the complete unit stops.	1. Refrigerant was superabundant. 2. Poor heat exchange (including filth blockage of heat exchanger and bad radiating environment); 3. Ambient temperature is too high.
2	Antifreezing protection	**E2**	Blinks twice			Blinks 3 times			During cooling and drying operation, compressor and outdoor fan stop while indoor fan operates.	1. Poor air-return in indoor unit. 2. Fan speed is abnormal. 3. Evaporator is dirty.
3	Refrigerant leakage protection	**F0**					Blinks 9 times		The Dual-8 Code Display will show F0 and the complete unit stops.	1. Refrigerant leakage; 2. Indoor evaporator temperature sensor works abnormally; 3. The unit has been plugged up somewhere.
4	High discharge Temperature protection of compressor	**E4**	Blinks 4 times			Blinks 7 times			- During cooling and drying operation, compressor and outdoor fan stop while indoor fan operates. - During heating operation, all loads stop.	Please refer to the malfunction analysis (discharge protection, overload).
5	Overcurrent protection	**E5**	Blinks 5 times			Blinks 5 times			- During cooling and drying operation, compressor and outdoor fan stop while indoor fan operates. - During heating operation, all loads stop.	1. Supply voltage is unstable. 2. Supply voltage is too low and load is too high. 3. Current is too high.
6	Communication Malfunction	**E6**	Blinks 6 times			Always ON			- During cooling operation, compressor stops while indoor fan motor operates. - During heating operation, the complete unit stops.	Refer to the corresponding malfunction analysis.
7	High temp. resistant protection	**E8**	Blinks 8 times			Blinks 6 times			- During cooling operation: compressor will stop while indoor fan will operate. - During heating operation, the complete unit stops.	Refer to the malfunction analysis (overload, high temperature resistant).
8	EEPROM malfunction	**EE**			Blinks 15 times	Blinks 11 times			- During cooling and drying operation, compressor will stop while indoor fan will operate. - During heating operation, the complete unit will stop	Replace outdoor control panel AP1.
9	Limit/decrease frequency due to high temp of module	**EU**		Blinks 6 times	Blinks 6 times				All loads operate normally, while operation frequency for compressor is decreased	Discharging after the complete unit is de-energized for 20min, check whether the thermal grease on IPM Module of outdoor control panel AP1 is sufficient and whether the radiator is inserted tightly. If it's no use, please replace control panel AP1.

10	Malfunction protection of jumper cap	**C5**	Blinks 15 times						Wireless remote receiver and button are effective, but can not dispose the related command	1. No jumper cap insert on mainboard. 2. Incorrect insert of jumper cap. 3. Jumper cap damaged. 4. Abnormal detecting circuit of mainboard.
11	Gathering refrigerant	**F0**	Blinks 1 time	Blinks 1 time		Blinks 17 time			When the outdoor unit receive signal of Gathering refrigerant, the system will be forced to run under cooling mode for gathering refrigerant	Nominal cooling mode
12	Indoor ambient temperature sensor is open/short circuited	**F1**		Blinks once					- During cooling and drying operation, indoor unit operates while other loads will stop. - During heating operation, the complete unit will stop operation.	1. Indoor ambient temperature sensor hasn't been connected well with indoor unit's control panel AP1 (refer to the wiring diagram for indoor unit). 2. Room temperature sensor is damaged (refer to the resistance table of temp. sensor appendix 1) 3 Mainboard damaged
13	Indoor evaporator temperature sensor is open/short circuited	**F2**		Blinks twice					- During cooling and drying operation, indoor unit will operate while other loads will stop; - During heating operation, the complete unit will stop operation.	1. Evaporator temp. sensor hasn't been connected well with indoor unit's control panel AP1 (refer to the wiring diagram for indoor unit). 2. Evaporator temp. sensor is damaged (please refer to the resistance table of temp. sensor).
14	Outdoor ambient temperature sensor is open/short circuited	**F3**		Blinks 3 times			Blinks 6 times		- During cooling and drying operating, compressor stops while indoor fan operates; - During heating operation, the complete unit will stop operation	1. Outdoor ambient temp. sensor hasn't been connected well or is damaged. 2. Please check it by referring to the resistance table for temperature sensor appendix 1).
15	Outdoor condenser temperature sensor is open/short circuited	**F4**		Blinks 4 times			Blinks 5 times		- During cooling and drying operation, compressor stops while indoor fan will operate; - During heating operation, the complete unit will stop operation.	1. Condenser temp. sensor hasn't been connected well or is damaged. 2. Please check it by referring to the resistance table for temperature sensor appendix 2)
16	Outdoor discharge temperature sensor is open/short circuited	**F5**		Blinks 5 times			Blinks 7 times		- During cooling and drying operation, compressor will sop after operating for about 3 minutes, while indoor fan will operate; - During heating operation, the complete unit will stop after operating for about 3 minutes.	1. Outdoor discharge temp. sensor hasn't been connected well or is damaged. Please check it by referring to the resistance table for temp. sensor appendix 3). 2. The head of temp. sensor hasn't been inserted into the copper tube.
17	Limit/decrease frequency due to overload	**F6**		Blinks 6 times			Blinks 3 times		All loads operate normally, while operation frequency for compressor is decreased	Refer to the malfunction analysis (overload, high temperature resistant).
18	Decrease frequency due to overcurrent	**F8**		Blinks 8 times			Blinks once		All loads operate normally, while operation frequency for compressor is decreased	The input supply voltage is too low; System pressure is too high and overload.

19	Decrease frequency due to high air discharge	**F9**		Blinks 9 times			Blinks twice		All loads operate normally, while operation frequency for compressor is decreased	1. Overload or temperature is too high. 2. Refrigerant is insufficient; 3. Malfunction of electric expansion valve (EXV.
20	Limit/decrease frequency due to antifreezing	**FH**		Blinks 2 times	Blinks 2 times		Blinks 4 times		All loads operate normally, while operation frequency for compressor is decreased	Poor air-return in indoor unit or fan speed is too low
21	DC generatrix voltage is too high	**PH**		Blinks 11 times		Blinks 13 times			During cooling, dehumidifying, compressor stop running fan motor works. During heating: all will stop	1. Testing the voltage of position L and N on terminal XT, if higher than 265VAC, please cut off the power supply and restart until back to normal. 2. If input voltage is normal, testing the voltage of electrolytic capacitor C on AP1 after turn on the unit. There may be some problem and replace the AP1 if the electrolytic capacitor voltage range at 200-280V.
22	Voltage of DC bus-bar is too low	**PL**			Blinks 21 times	Blinks 12 times			- During cooling and drying operation, compressor will stop while indoor fan will operate. - During heating operation, the complete unit will stop.	1. Measure the voltage of position L and N on wiring board (XT), if the voltage is higher than 150VAC, turn on the unit after the supply voltage is increased to the normal range. 2. If the AC input is normal, measure the voltage of electrolytic capacitor C on control panel (AP1), if it's normal, there's malfunction for the circuit, please replace the control panel (AP1)
23	Compressor Min frequence in test state	**P0**		Blinks 0.25Hz	Blinks 0.25Hz					Showing during min. cooling or min. heating test
24	Compressor rated frequence in test state	**P1**		Blinks 0.25Hz	Blinks 0.25Hz					Showing during nominal cooling or nominal heating test
25	Compressor Max frequence in test state	**P2**		Blinks 0.25Hz	Blinks 0.25Hz					Showing during max. cooling or max. heating test
26	Compressor intermediate frequence in test state	**P3**		Blinks 0.25Hz	Blinks 0.25Hz					Showing during middle cooling or middle heating test
27	Overcurrent protection of phase current for compressor	**P5**		Blinks 0.25Hz	Blinks 0.25Hz				During cooling and drying operation, compressor will stop while indoor fan will operate; During heating operation, the complete unit will stop operation.	Refer to the malfunction analysis (IPM protection, loss of synchronism protection and overcurrent protection of phase current for compressor.
28	Charging malfunction of capacitor	**PU**			Blinks 17 times				- During cooling and drying operation, compressor will stop while indoor fan will operate. - During heating operation, the complete unit will stop.	Refer to the part three—charging malfunction analysis of capacitor.
29	Malfunction of module temp. sensor circuit	**P7**			Blinks 18 times				- During cooling and drying operation, compressor will stop while indoor fan will operate; - During heating operation, the complete unit will stop	Replace outdoor control panel AP1

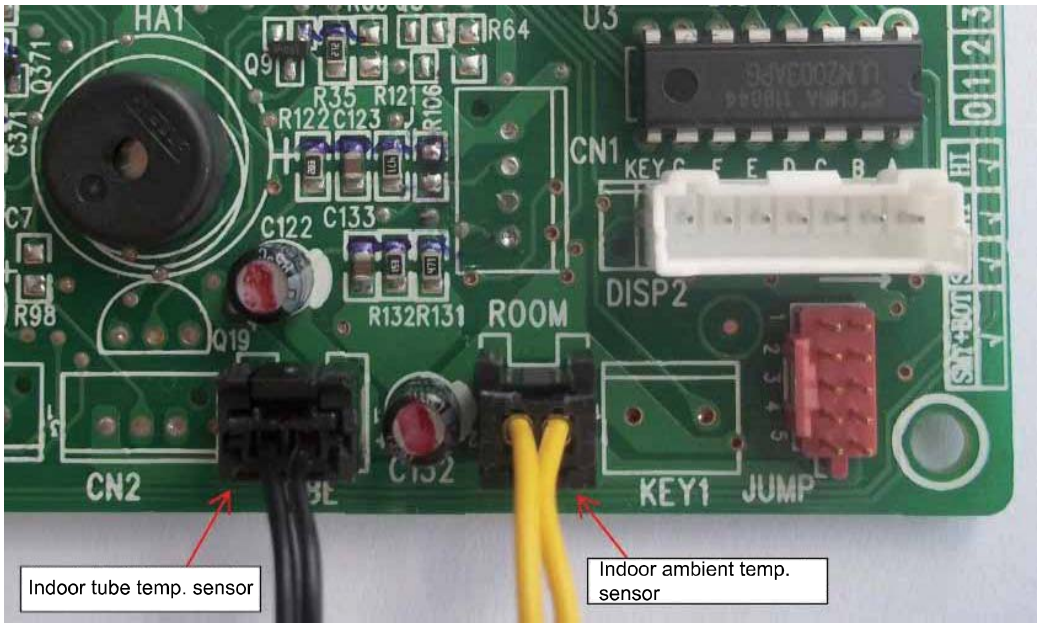
30	Module high temperature protection	**P8**			Blinks 19 times				During cooling operation, compressor will stop while indoor fan will operate; During heating operation, the complete unit will stop	After the complete unit is deenergized for 20mins, check whether the thermal grease on IPM Module of outdoor control panel AP1 is sufficient and whether the radiator is inserted tightly. If it's no use, please replace control panel AP1.
31	Decrease frequency due to high temp. resistant during heating operation	**H0**			Blinks 10 times				All loads operate normally, while operation frequency for compressor is decreased	Refer to the malfunction analysis (overload, high temperature resistant)
32	Static dedusting protection	**H2**			Blinks twice					
33	Overload protection for compressor	**H3**			Blinks 3 times	Blinks 8 times			- During cooling and drying operation, compressor will stop while indoor fan will operate; - During heating operation, the complete unit will stop operation.	1. Wiring terminal OVC-COMP is loosened. In normal state, the resistance for this terminal should be less than 1ohm. 2. Refer to the malfunction analysis (discharge protection, overload)
34	System is abnormal	**H4**			Blinks 4 times	Blinks 6 times			- During cooling and drying operation, compressor will stop while indoor fan will operate; - During heating operation, the complete unit will stop operation.	Refer to the malfunction analysis (overload, high temperature resistant)
35	IPM protection	**H5**			Blinks 5 times	Blinks 4 times			- During cooling and drying operation, compressor will stop while indoor fan will operate; - During heating operation, the complete unit will stop operation	Refer to the malfunction analysis (IPM protection, loss of synchronism protection and overcurrent protection of phase current for compressor.
36	Module temp. is too high	**H5**			Blinks 5 times	Blinks 10 times				
37	Internal motor (fan motor) do not operate	**H6**	Blinks 11 times						Internal fan motor, external fan motor, compressor and electric heater stop operation, guide louver stops at present location.	1. Bad contact of DC motor feedback terminal. 2. Bad contact of DC motor control end. 3. Fan motor is stalling. 4. Motor malfunction. 5. Malfunction of mainboard rev detecting circuit.
38	Desynchronizing of compressor	**H7**			Blinks 7 times				During cooling and drying operation, compressor will stop while indoor fan will operate; During heating operation, the complete unit will stop operation.	Refer to the malfunction analysis (IPM protection, loss of synchronism protection and overcurrent protection of phase current for compressor.
39	PFC protection	**HC**			Blinks 6 times	Blinks 14 times			- During cooling and drying operation, compressor will stop while indoor fan will operate; - During heating operation, the unit will stop operation	Refer to the malfunction analysis.
40	Outdoor DC fan motor malfunction	**L3**	Blinks 23 times				Blinks 14 times		Outdoor DC fan motor malfunction lead to compressor stop operation,	DC fan motor malfunction or system blocked or the connector loosed
41	Power protection	**L9**	Blinks 20 times			Blinks 9 times			compressor stop operation and outdoor fan motor will stop 30s latter, 3 minutes latter fan motor and compressor will restart	To protect the electronical components when detect high power

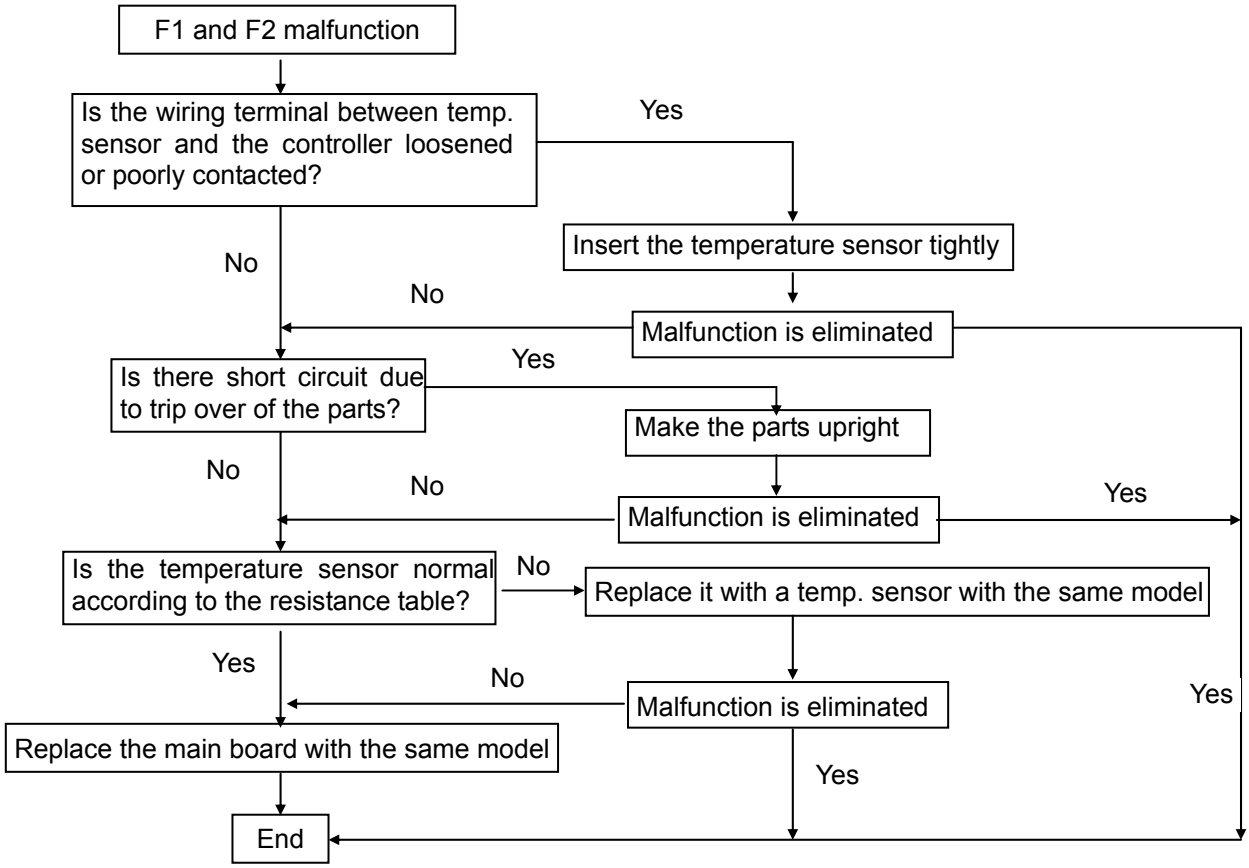
42	Indoor unit and outdoor unit does not match	**LP**	Blinks 19 times			Blinks 16 times			compressor and outdoor fan motor can't work	Indoor unit and outdoor unit doesn't match
43	Failure start-up	**LC**			Blinks 11 times				- During cooling and drying operation, compressor will stop while indoor fan will operate. - During heating operation, the complete unit will stop operation.	Refer to the malfunction analysis.
44	Malfunction of phase current detection circuit for compressor	**U1**			Blinks 13 times				- During cooling and drying operation, compressor will stop while indoor fan will operate; - During heating operation, the complete unit will stop	Replace outdoor control panel.
45	Malfunction of voltage dropping for DC bus-bar	**U3**			Blinks 20 times				- During cooling and drying operation, compressor will stop while indoor fan will operate; - During heating operation, the complete unit will stop.	Supply voltage is unstable.
46	Malfunction of complete unit's current detection	**U5**		Blinks 13 times					- During cooling and drying operation, the compressor will stop while indoor fan will operate; - During heating operating, the complete unit will stop operation.	There's circuit malfunction on outdoor unit's control panel AP1, please replace the outdoor unit's control panel AP1.
47	The four-way valve is abnormal	**U7**		Blinks 20 times					If this malfunction occurs during heating operation, the complete unit will stop operation.	1. Supply voltage is lower than AC175V; 2. Wiring terminal 4V is loosened or broken; 3.4V is damaged, please replace 4V.
48	Zerocrossing malfunction of outdoor unit	**U9**		Blinks 18 times					During cooling operation, compressor will stop while indoor fan will operate; during heating, the complete unit will stop operation.	Replace outdoor control panel AP1
49	Frequency limiting(power)						Blinks 13 times			
50	Compressor running					Blinks once				
51	The temp. for turning on the unit is reached						Blinks 8 times			
52	Frequency limiting(module temperature)						Blinks 11 times			
53	Normal comunication							Blinks once		
54	Defrosting				Blinks once (during blinking, ON 10s and OFF 0.5s)	Blinks twice			- Defrosting will occur in heating mode. Compressor will operate while indoor fan will stop operation.	It's the normal state.

8.4. How to check simply the main part

8.4.1 Indoor Unit:

8.4.1.1 Temperature sensor malfunction (F1/F2)



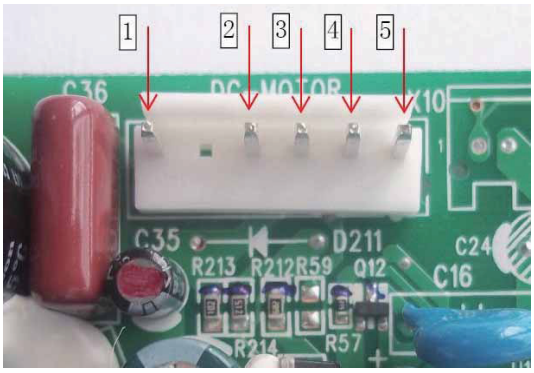


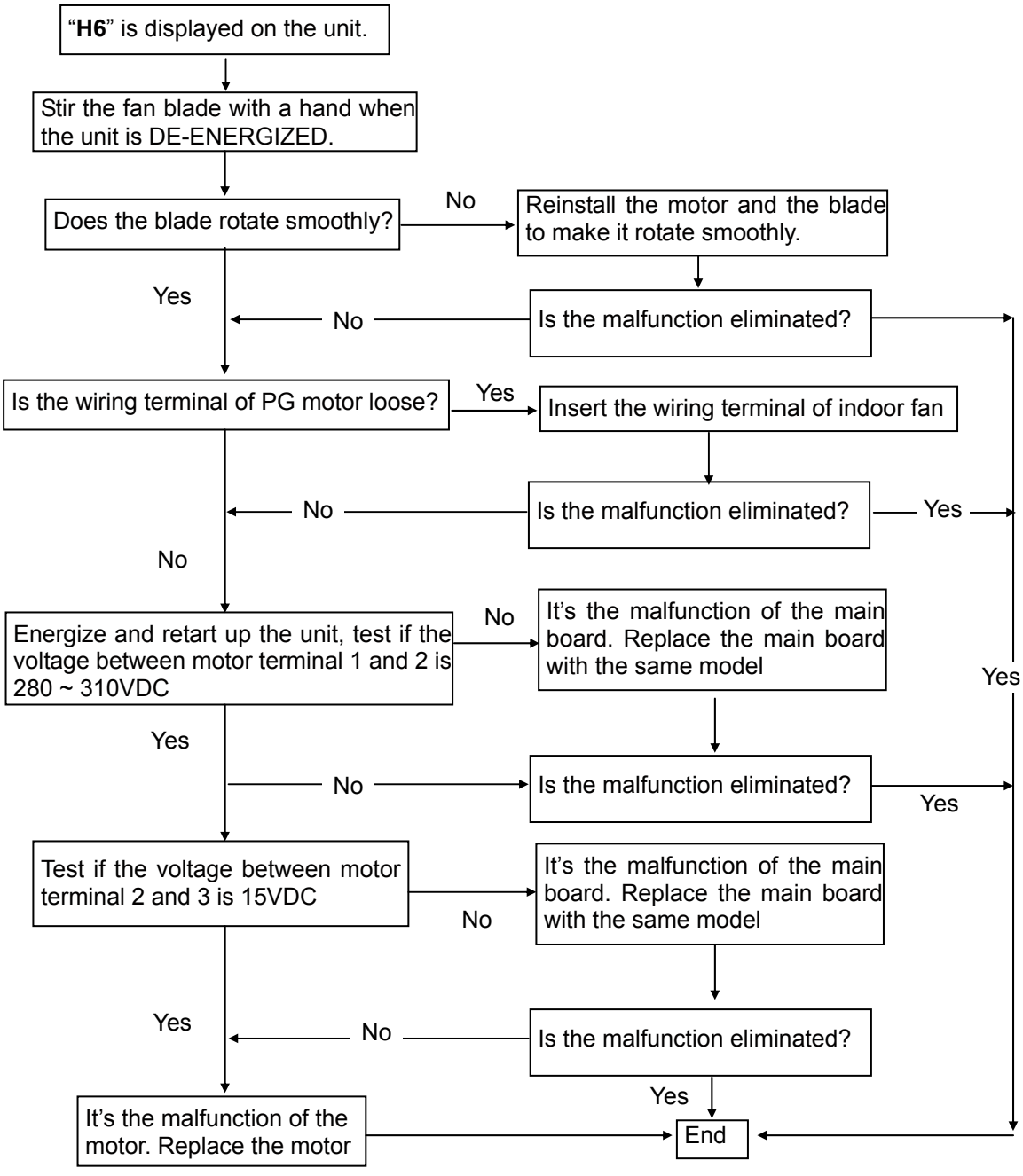
8.4.1.2 Indoor fan does not operate (H6 Malfunction)

Possible causes:

1. Fan motor is locked;
2. The feedback terminal of PG motor is not connected tightly;
3. The control terminal of PG motor is not connected tightly;
4. Motor is damaged;
5. Malfunction of the rotation speed detection circuit of the mainboard.

See the flow chart below:



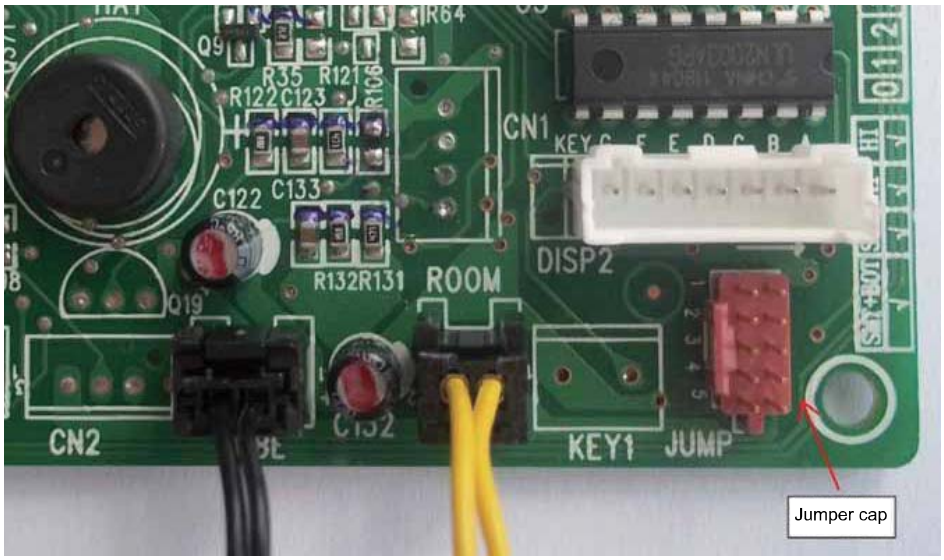

"H6" is displayed on the unit.
Stir the fan blade with a hand when the unit is DE-ENERGIZED.
Does the blade rotate smoothly?
No
Reinstall the motor and the blade to make it rotate smoothly.
Yes
No
Is the malfunction eliminated?
Is the wiring terminal of PG motor loose?
Yes
Insert the wiring terminal of indoor fan
No
Is the malfunction eliminated?
Yes
No
Energize and retart up the unit, test if the voltage between motor terminal 1 and 2 is 280 ~ 310VDC
No
It's the malfunction of the main board. Replace the main board with the same model
Yes
Yes
No
Is the malfunction eliminated?
Yes
Test if the voltage between motor terminal 2 and 3 is 15VDC
No
It's the malfunction of the main board. Replace the main board with the same model
Yes
No
Is the malfunction eliminated?
Yes
It's the malfunction of the motor. Replace the motor
End

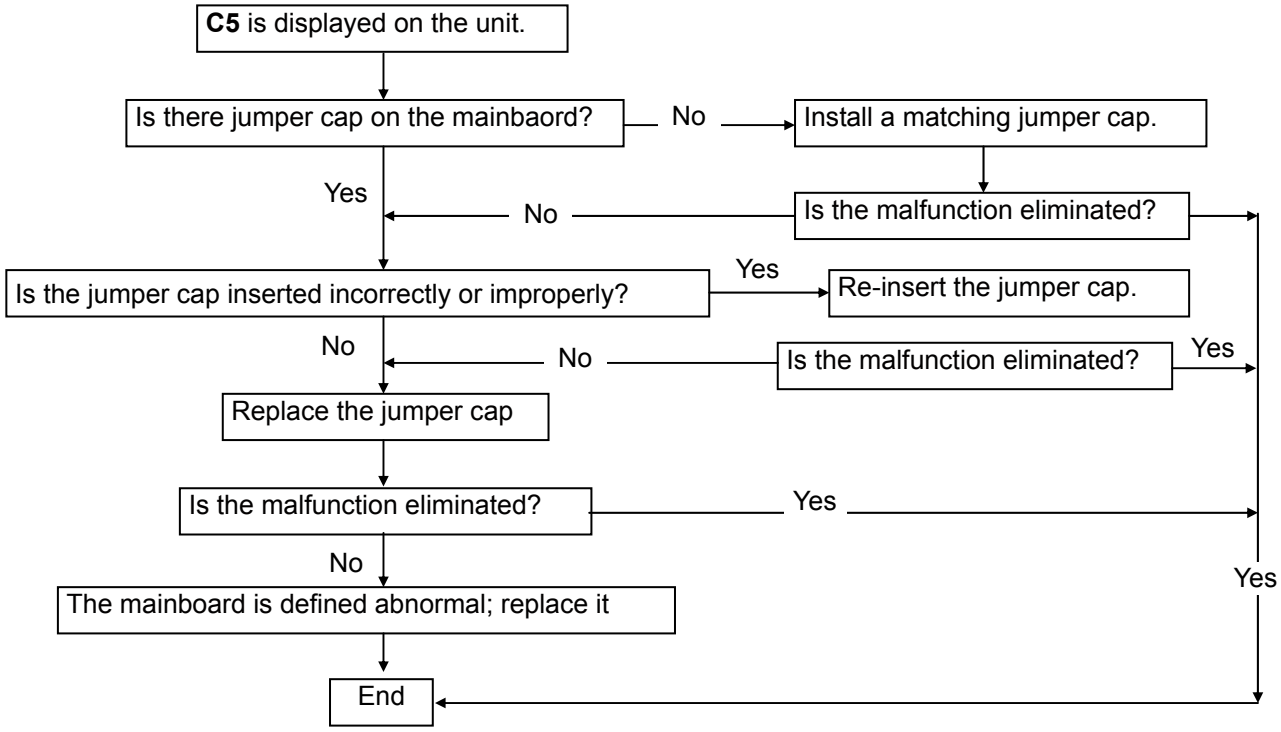
8.4.1.3. Jumper cap malfunction (C5)

Possible causes:

1. There is no jumper cap on the controller;
2. Jumper cap is not inserted properly and tightly;
3. Jumper cap is damaged;
4. Controller is damaged.

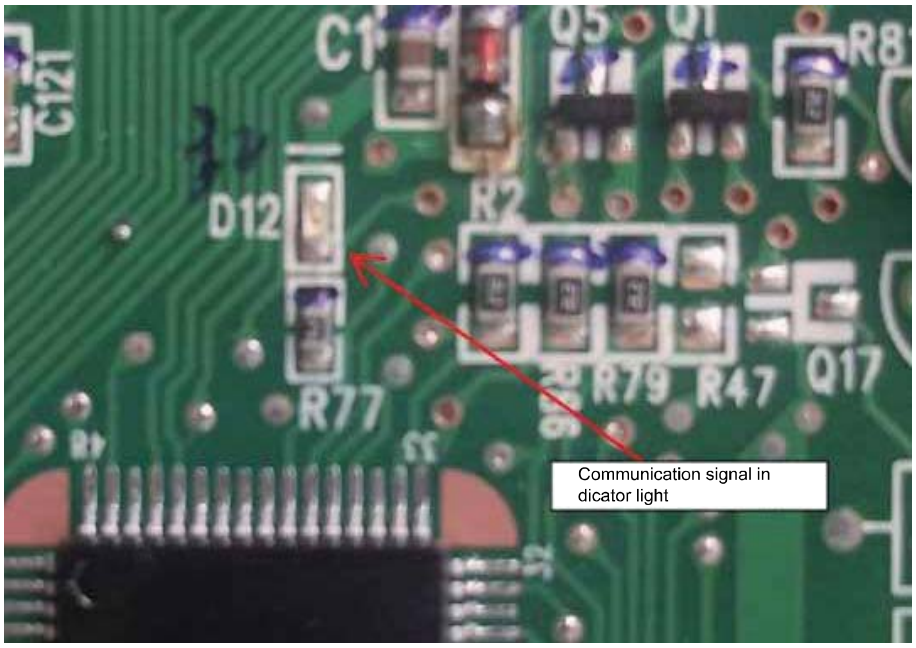
See the flow chart below:

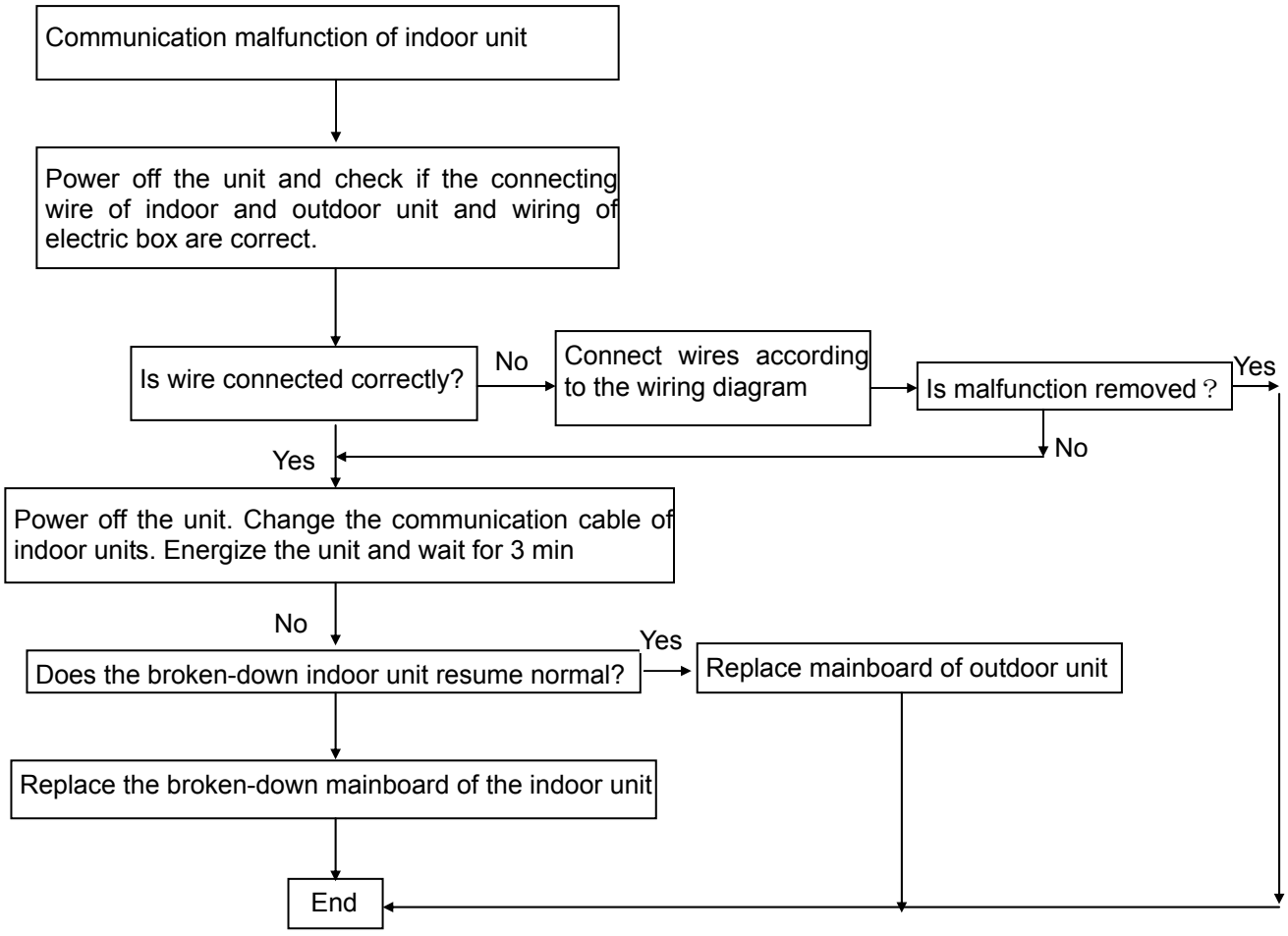




8.4.1.4 Communication Malfunction (E6)

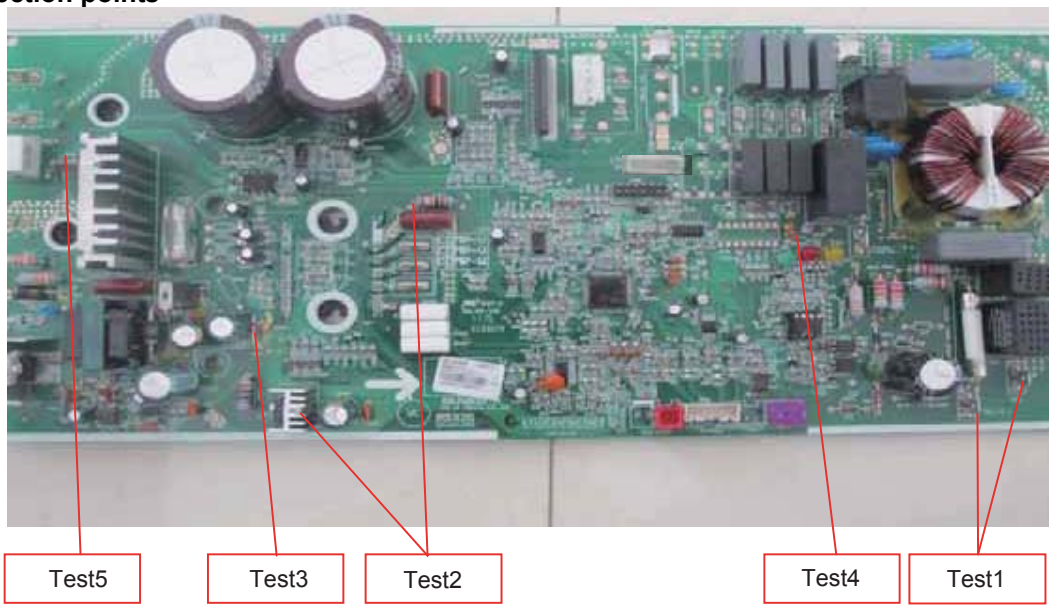
1. Check if connection wire between indoor and outdoor units and wire inside the unit are connected well.
2. Check if mainboard of indoor or outdoor unit is damaged.

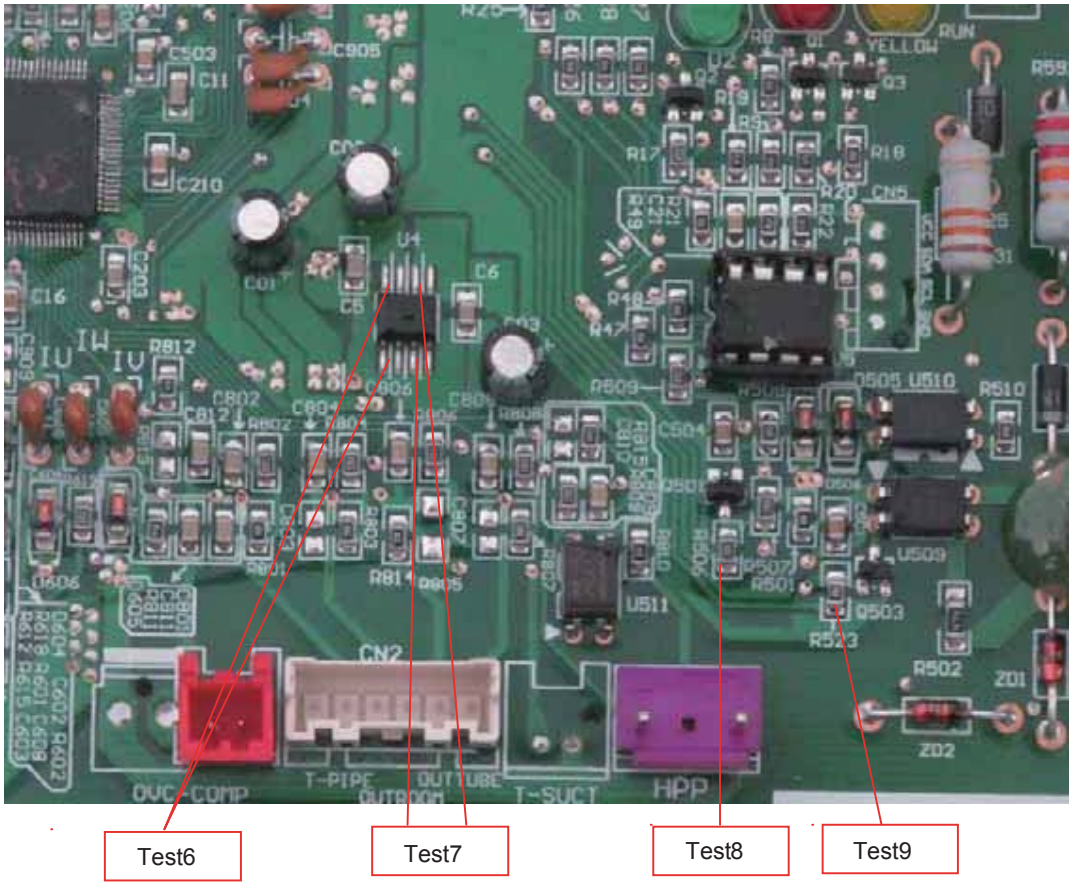



Communication malfunction of indoor unit
Power off the unit and check if the connecting wire of indoor and outdoor unit and wiring of electric box are correct.
Is wire connected correctly?
No
Connect wires according to the wiring diagram
Is malfunction removed ?
Yes
No
Yes
Power off the unit. Change the communication cable of indoor units. Energize the unit and wait for 3 min
No
Does the broken-down indoor unit resume normal?
Yes
Replace mainboard of outdoor unit
Replace the broken-down mainboard of the indoor unit
End

8.4.2 Outdoor Unit:

8.4.2.1 Key detection points





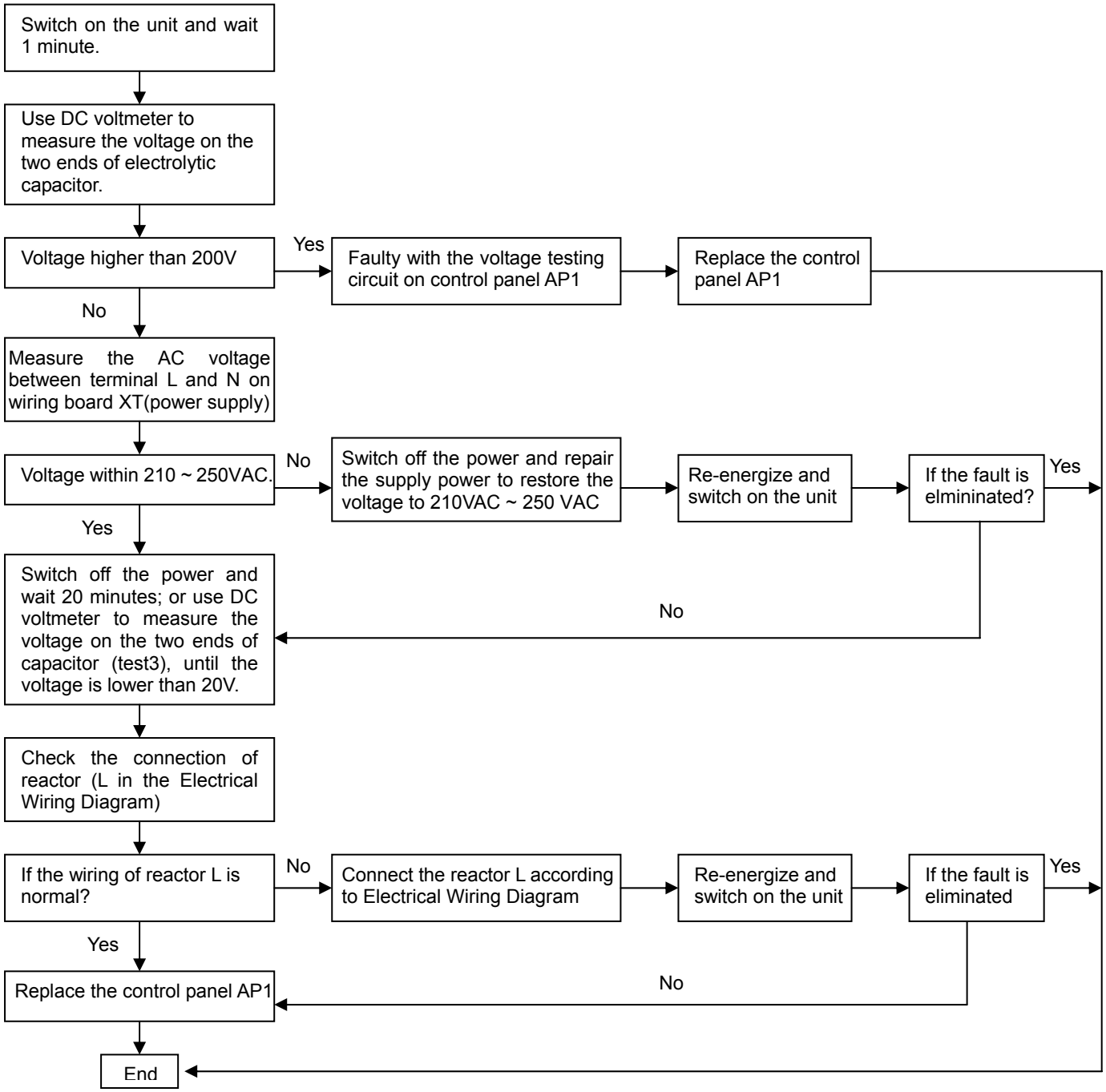
Test point SN	Test point	Related specification	Test value in normal condition
Test 1	Between AC-L1 and N1	Neutral and live wire	165V ~ 253V
Test 2	Left side of R201, radiator U404	DC bus bar	230V ~ 380V
Test 3	Top of D304, Bottom of D304	IPM drive voltage + 15V	13,5V ~ 15,5V
Test 4	Top of C116, bottom of C116	Relay drive voltage +12V	11V ~ 13V
Test 5	Right side of R228, left side of D228	PFC drive voltage +15V	13,5V ~ 15,5V
Test 6	Left and top ends of U4, bottom of U4	Chip +3,3V	3,1V ~ 3,3V
Test 7	Right and top end of U4, bottom of U4	+5V	4,8V ~ 5,1V
Test 8	Bottom of R506, bottom of U4	Outdoor unit receiving signal	Fluctuate between 0 and 3,3V
Test 9	Bottom of R523, bottom of U4	Outdoor unit sending signal	Fluctuate between 0 and 3,3V

8.4.2.2. Capacitor charging malfunction (Fault with outdoor unit) (AP1 below refers to the outdoor control panel)

Main detection point:

- Use AC voltmeter to check if the voltage between terminal L and N on the wiring board is within 210VAC ~ 240VAC.
- If the reactor (L) is correctly connected? If the connection is loose or fallen? If the reactor (L) is damaged?

Fault diagnosis proess:


Switch on the unit and wait 1 minute.
Use DC voltmeter to measure the voltage on the two ends of electrolytic capacitor.
Voltage higher than 200V
Yes
Faulty with the voltage testing circuit on control panel AP1
Replace the control panel AP1
No
Measure the AC voltage between terminal L and N on wiring board XT(power supply)
Voltage within 210 ~ 250VAC.
No
Switch off the power and repair the supply power to restore the voltage to 210VAC ~ 250 VAC
Re-energize and switch on the unit
If the fault is elmininated?
Yes
Yes
Switch off the power and wait 20 minutes; or use DC voltmeter to measure the voltage on the two ends of capacitor (test3), until the voltage is lower than 20V.
No
Check the connection of reactor (L in the Electrical Wiring Diagram)
If the wiring of reactor L is normal?
No
Connect the reactor L according to Electrical Wiring Diagram
Re-energize and switch on the unit
If the fault is eliminated
Yes
Yes
Replace the control panel AP1
No
End

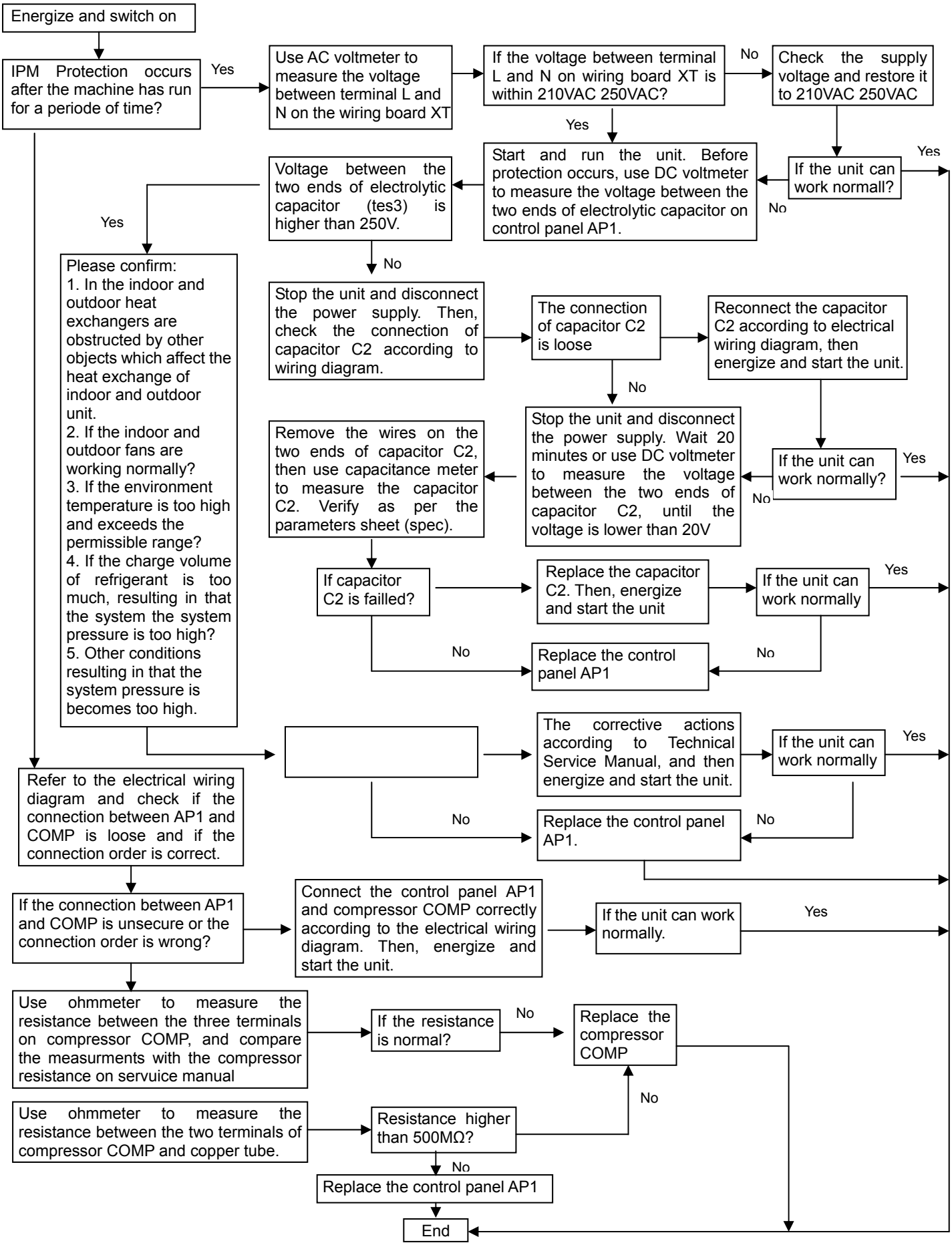
8.4.2.3 IPM Protection, desynchronizing malfunction, **Compressor Phase Overcurrent** (AP1 below refers to the outdoor control panel)

Main detection point:

- If the connection between control panel AP1 and compressor COMP is secure? If loose? If the connections are correct?
- If the voltage input of the machine is within normal range? (use AC voltmeter to measure the voltage between terminal L and N on the wiring board XT)
- If the compressor coil resistance is normal? If the insulation of compressor coil's against the copper tube is in good condition?

- If the working loads of the machine are too hight? If the radiation is good?
- If the charge volume of refrigerant is correct?

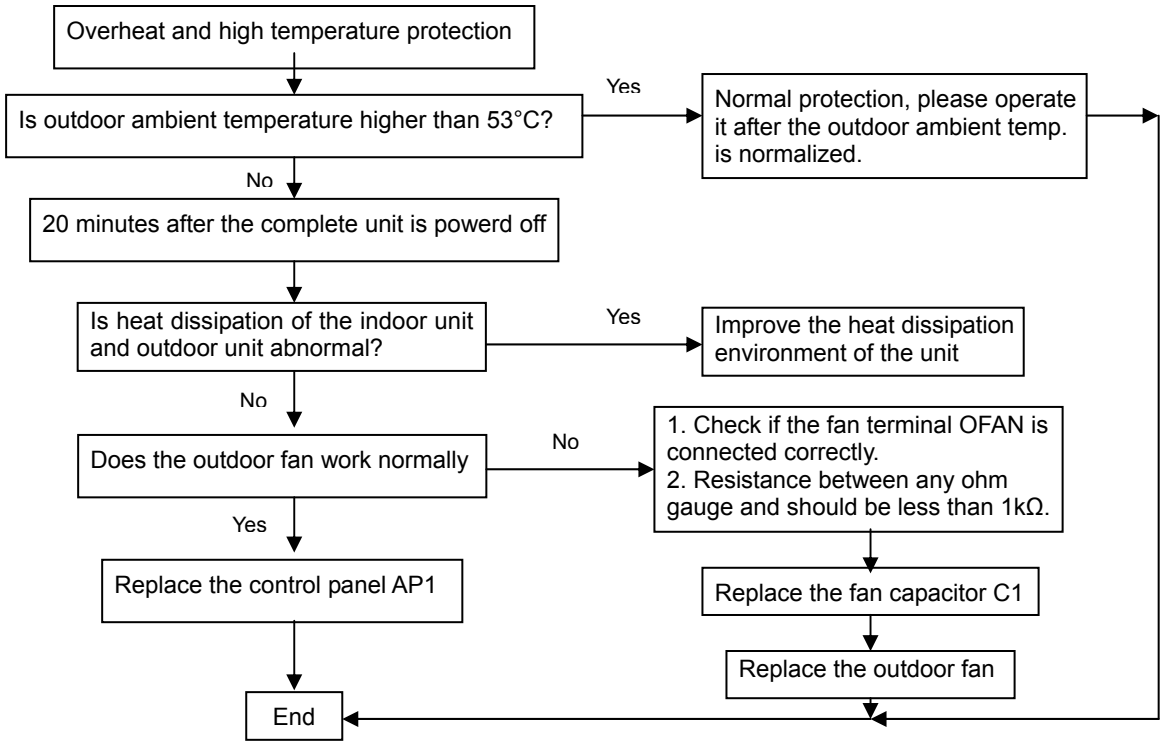
Fault diagnosis process:


Energize and switch on
IPM Protection occurs after the machine has run for a periode of time?
Yes
Use AC voltmeter to measure the voltage between terminal L and N on the wiring board XT
If the voltage between terminal L and N on wiring board XT is within 210VAC 250VAC?
No
Check the supply voltage and restore it to 210VAC 250VAC
Yes
Start and run the unit. Before protection occurs, use DC voltmeter to measure the voltage between the two ends of electrolytic capacitor on control panel AP1.
If the unit can work normall?
Yes
No
Voltage between the two ends of electrolytic capacitor (tes3) is higher than 250V.
Yes
No
Please confirm:
1. In the indoor and outdoor heat exchangers are obstructed by other objects which affect the heat exchange of indoor and outdoor unit.
2. If the indoor and outdoor fans are working normally?
3. If the environment temperature is too high and exceeds the permissible range?
4. If the charge volume of refrigerant is too much, resulting in that the system the system pressure is too high?
5. Other conditions resulting in that the system pressure is becomes too high.
Stop the unit and disconnect the power supply. Then, check the connection of capacitor C2 according to wiring diagram.
The connection of capacitor C2 is loose
Reconnect the capacitor C2 according to electrical wiring diagram, then energize and start the unit.
No
Stop the unit and disconnect the power supply. Wait 20 minutes or use DC voltmeter to measure the voltage between the two ends of capacitor C2, until the voltage is lower than 20V
If the unit can work normally?
Yes
No
Remove the wires on the two ends of capacitor C2, then use capacitance meter to measure the capacitor C2. Verify as per the parameters sheet (spec).
If capacitor C2 is failled?
Replace the capacitor C2. Then, energize and start the unit
If the unit can work normally
Yes
No
Replace the control panel AP1
No
The corrective actions according to Technical Service Manual, and then energize and start the unit.
If the unit can work normally
Yes
No
Replace the control panel AP1.
No
Refer to the electrical wiring diagram and check if the connection between AP1 and COMP is loose and if the connection order is correct.
If the connection between AP1 and COMP is unsecure or the connection order is wrong?
Connect the control panel AP1 and compressor COMP correctly according to the electrical wiring diagram. Then, energize and start the unit.
If the unit can work normally.
Yes
Use ohmmeter to measure the resistance between the three terminals on compressor COMP, and compare the measurments with the compressor resistance on servuice manual
If the resistance is normal?
No
Replace the compressor COMP
No
Use ohmmeter to measure the resistance between the two terminals of compressor COMP and copper tube.
Resistance higher than 500MΩ?
No
Replace the control panel AP1
End

8.4.2.4. High temperature and overload protection diagnosis (AP1 herinafter refers to control board of the outdoor unit)

Main detection point:

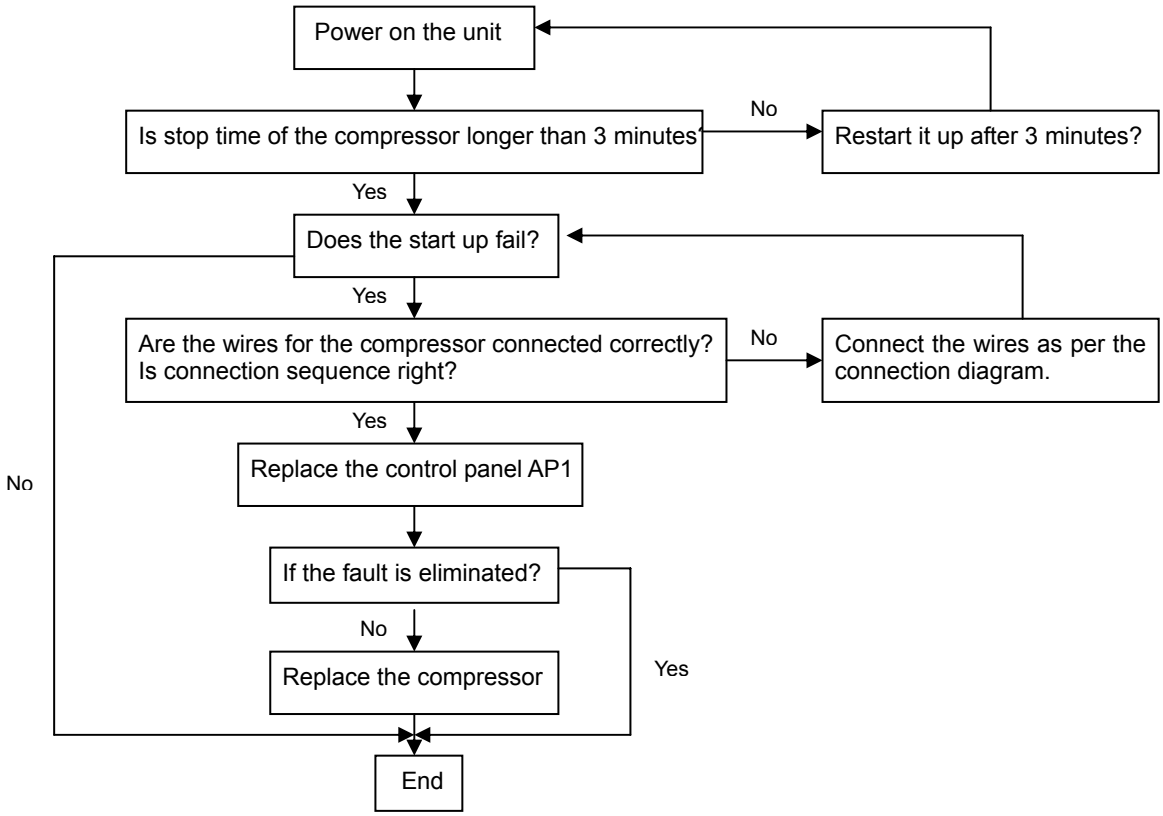
● Is outdoor ambient temperature in normal range?
● Are the outdoor and indoor fans operating normally?
● Is the heat dissipation environment inside and ouside the unit is good?


Overheat and high temperature protection
Is outdoor ambient temperature higher than 53°C?
Yes
Normal protection, please operate it after the outdoor ambient temp. is normalized.
No
20 minutes after the complete unit is powerd off
Is heat dissipation of the indoor unit and outdoor unit abnormal?
Yes
Improve the heat dissipation environment of the unit
No
Does the outdoor fan work normally
No
1. Check if the fan terminal OFAN is connected correctly.
2. Resistance between any ohm gauge and should be less than 1kΩ.
Yes
Replace the control panel AP1
Replace the fan capacitor C1
Replace the outdoor fan
End

8.4.2.5. Start up failure (following AP1 for outdoor unit control board)

Main detection point:

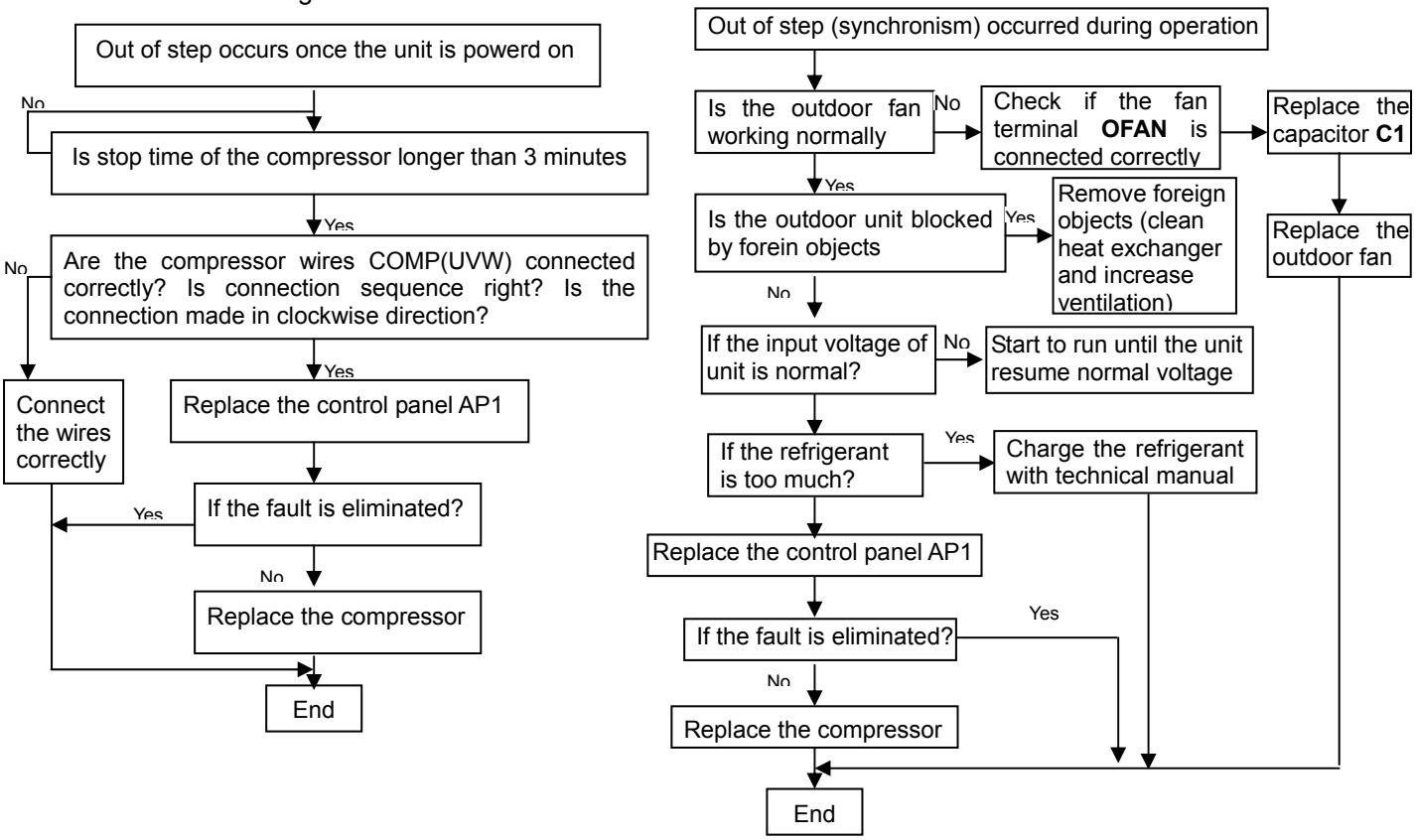
● Whether the compressor wiring is connected correct?
● Is time for compressor stopping enough?
● Is compressor broken?
● Is the refrigerant charging is too much?



8.4.2.6 Diagnosis for compressor Out of step (synchronism)(AP1 hereinafter refers to control board of the outdoor unit)

Main detection point:

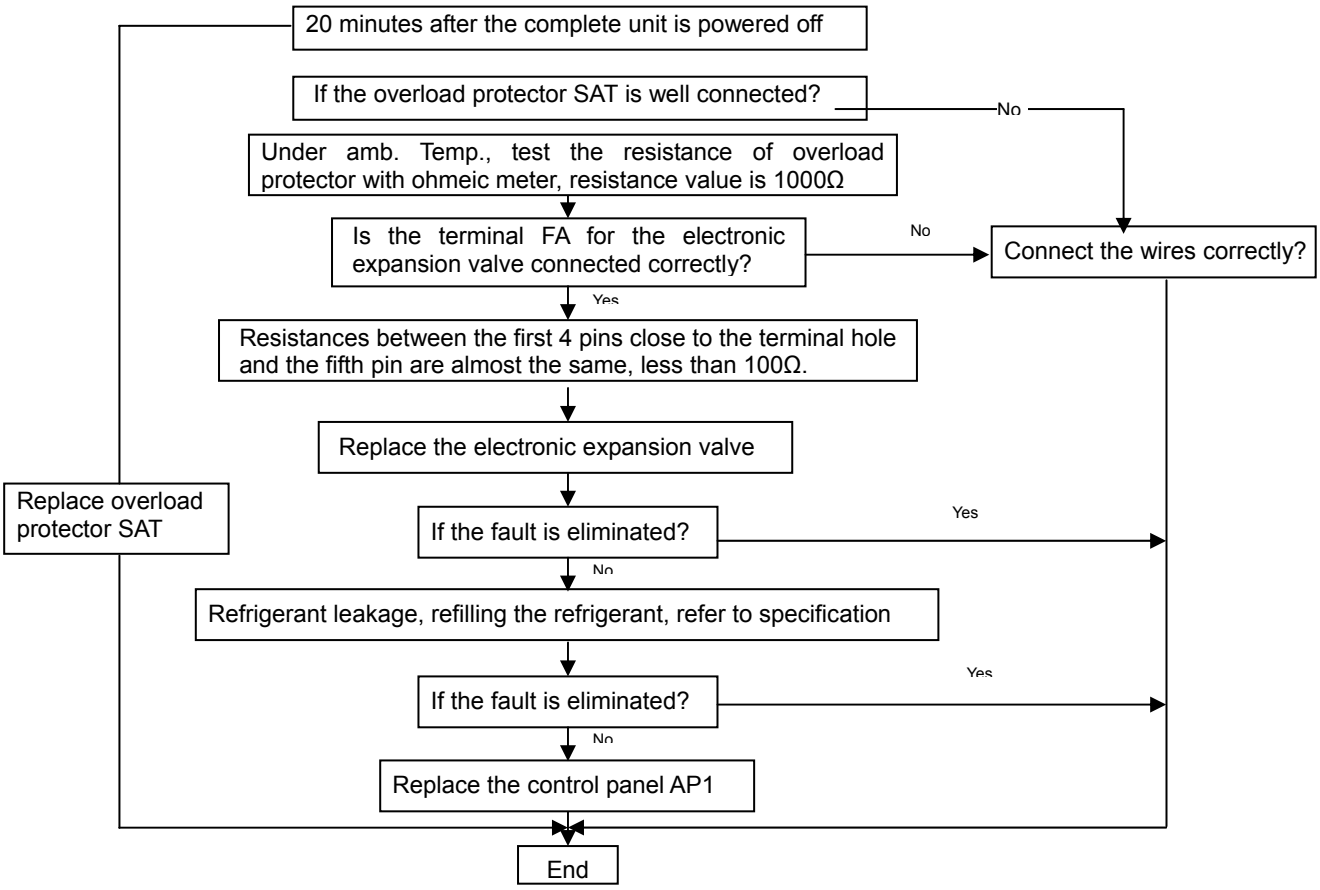
● Whether the unit voltage is too high?
● Whether the work voltage is too low?


Out of step occurs once the unit is powerd on
No
Is stop time of the compressor longer than 3 minutes
Yes
No
Are the compressor wires COMP(UVW) connected correctly? Is connection sequence right? Is the connection made in clockwise direction?
Yes
Connect the wires correctly
Replace the control panel AP1
Yes
If the fault is eliminated?
No
Replace the compressor
End
Out of step (synchronism) occurred during operation
Is the outdoor fan working normally
No
Check if the fan terminal OFAN is connected correctly
Replace the capacitor C1
Yes
Is the outdoor unit blocked by forein objects
Yes
Remove foreign objects (clean heat exchanger and increase ventilation)
Replace the outdoor fan
No
If the input voltage of unit is normal?
No
Start to run until the unit resume normal voltage
If the refrigerant is too much?
Yes
Charge the refrigerant with technical manual
Replace the control panel AP1
If the fault is eliminated?
Yes
No
Replace the compressor
End

8.4.2.7 Overload and discharge malfunction detect (following AP1 for outdoor unit control board)

Main detection point:

● Wether the electronic expansion valve is connected well or not? ● Is electronic expansion valve damaged?
● Is the refrigerant leaked?

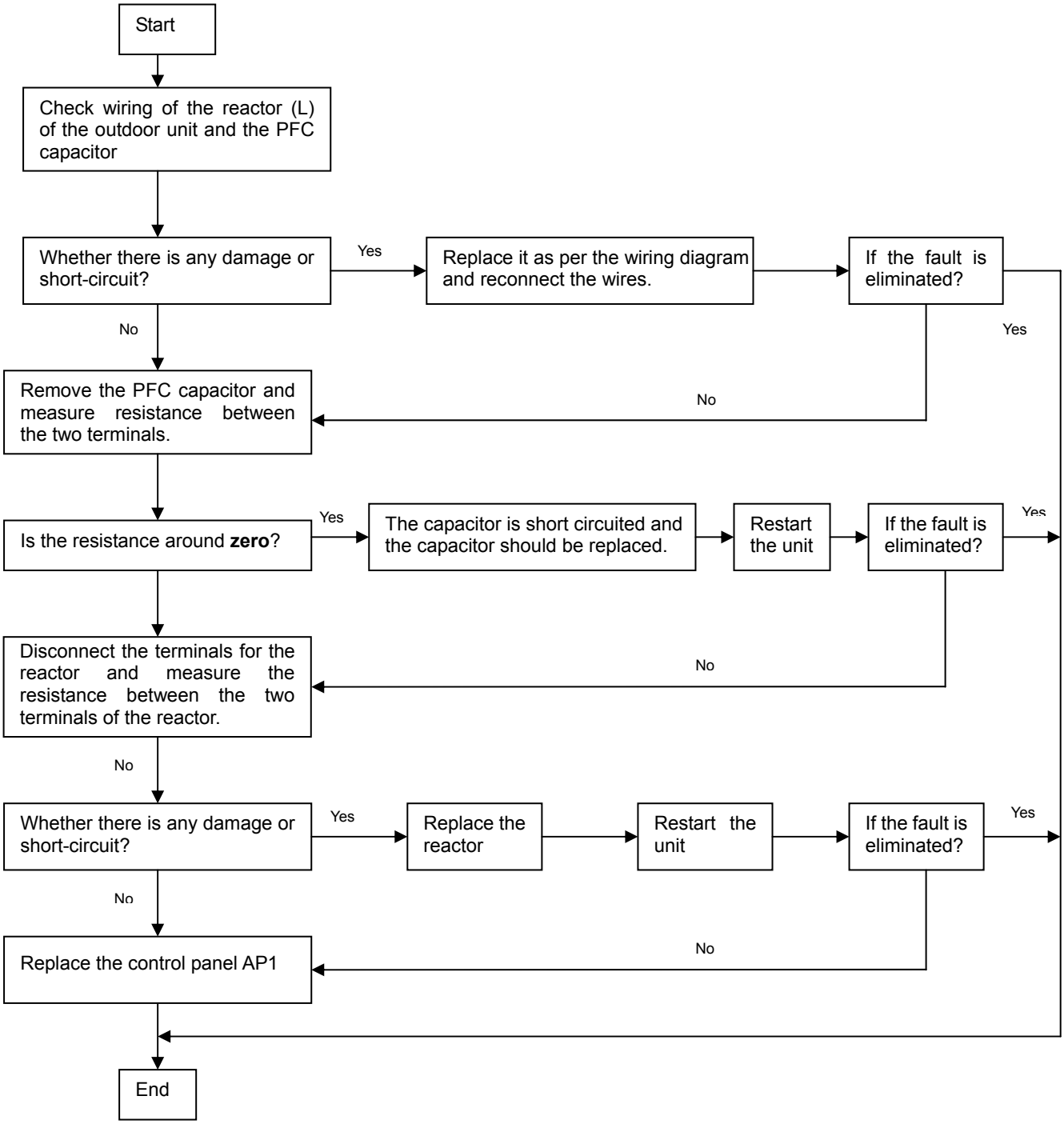

20 minutes after the complete unit is powered off
If the overload protector SAT is well connected?
No
Under amb. Temp., test the resistance of overload protector with ohmeic meter, resistance value is 1000Ω
Is the terminal FA for the electronic expansion valve connected correctly?
No
Connect the wires correctly?
Yes
Resistances between the first 4 pins close to the terminal hole and the fifth pin are almost the same, less than 100Ω.
Replace the electronic expansion valve
Replace overload protector SAT
If the fault is eliminated?
Yes
No
Refrigerant leakage, refilling the refrigerant, refer to specification
If the fault is eliminated?
Yes
No
Replace the control panel AP1
End

8.4.2.8 Power factor correction (PFC) fault (a fault of outdoor unit) (AP1 hereinafter refers to the control board of the outdoor unit)

Main detection point:

● Check if the reactor (L) of the outdoor unit and the PFC capacitor are broken?

The failure diagnosis is as follows:


Start
Check wiring of the reactor (L) of the outdoor unit and the PFC capacitor
Whether there is any damage or short-circuit?
Yes
Replace it as per the wiring diagram and reconnect the wires.
If the fault is eliminated?
Yes
No
No
Remove the PFC capacitor and measure resistance between the two terminals.
Is the resistance around zero?
Yes
The capacitor is short circuited and the capacitor should be replaced.
Restart the unit
If the fault is eliminated?
Yes
No
Disconnect the terminals for the reactor and measure the resistance between the two terminals of the reactor.
No
Whether there is any damage or short-circuit?
Yes
Replace the reactor
Restart the unit
If the fault is eliminated?
Yes
No
No
Replace the control panel AP1
End

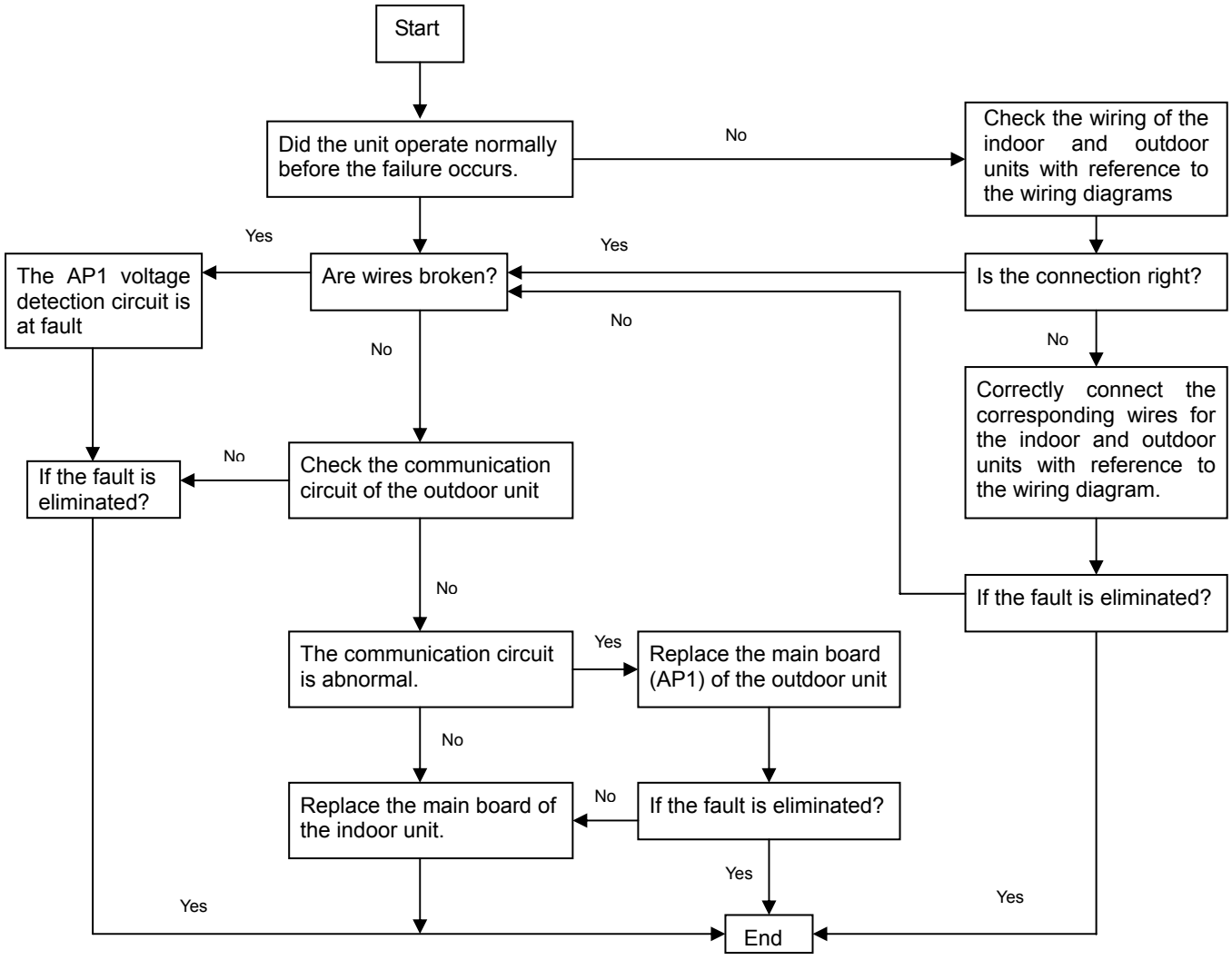
8.4.2.9 Communication malfunction (following AP1 for outdoor unit control board)

Main detection point:

● Detect the indoor and outdoor units connection wire and indoor and outdoor units inside wiring is connect well or not, if is there any damage?

● Is there any damage for the indoor unit mainboard communication circuit? Is communication circuit damaged?

The flow chart for the malfunction detect:


Start
Did the unit operate normally before the failure occurs.
No
Check the wiring of the indoor and outdoor units with reference to the wiring diagrams
Yes
Yes
The AP1 voltage detection circuit is at fault
Are wires broken?
Is the connection right?
No
No
No
Correctly connect the corresponding wires for the indoor and outdoor units with reference to the wiring diagram.
If the fault is eliminated?
No
Check the communication circuit of the outdoor unit
No
If the fault is eliminated?
The communication circuit is abnormal.
Yes
Replace the main board (AP1) of the outdoor unit
No
Replace the main board of the indoor unit.
No
If the fault is eliminated?
Yes
Yes
Yes
End

Appendix 1: Resistance table for indoor/outdoor ambient temperature sensors (numerical value of resistance) (15K)

Temp. (°C)	Resistance (kΩ)	Temp. (°C)	Resistance (kΩ)	Temp. (°C)	Resistance (kΩ)	Temp. (°C)	Resistance (kΩ)
-19	138.100	20	18.750	59	3.848	98	1.071
-18	128.600	21	17.930	60	3.711	99	1.039
-17	121.600	22	17.140	61	3.579	100	1.009
-16	115.000	23	16.390	62	3.454	101	0.980
-15	108.700	24	15.680	63	3.333	102	0.952
-14	102.900	25	15.000	64	3.217	103	0.925
-13	97.400	26	14.360	65	3.105	104	0.898
-12	92.220	27	13.740	66	2.998	105	0.873
-11	87.350	28	13.160	67	2.896	106	0.848
-10	82.750	29	12.600	68	2.797	107	0.825
-9	78.430	30	12.070	69	2.702	108	0.802
-8	74.350	31	11.570	70	2.611	109	0.779
-7	70.500	32	11.090	71	2.523	110	0.758
-6	66.880	33	10.630	72	2.439	111	0.737
-5	63.460	34	10.200	73	2.358	112	0.717
-4	60.230	35	9.779	74	2.280	113	0.697
-3	57.180	36	9.382	75	2.206	114	0.678
-2	54.310	37	9.003	76	2.133	115	0.660
-1	51.590	38	8.642	77	2.064	116	0.642
0	49.020	39	8.297	78	1.997	117	0.625
1	46.600	40	7.967	79	1.933	118	0.608
2	44.310	41	7.653	80	1.871	119	0.592
3	42.140	42	7.352	81	1.811	120	0.577
4	40.090	43	7.065	82	1.754	121	0.561
5	38.150	44	6.791	83	1.699	122	0.547
6	36.320	45	6.529	84	1.645	123	0.532
7	34.580	46	6.278	85	1.594	124	0.519
8	32.940	47	6.038	86	1.544	125	0.505
9	31.380	48	5.809	87	1.497	126	0.492
10	29.900	49	5.589	88	1.451	127	0.480
11	28.510	50	5.379	89	1.408	128	0.467
12	27.180	51	5.197	90	1.363	129	0.456
13	25.920	52	4.986	91	1.363	130	0.444
14	24.730	53	4.802	92	1.282	131	0.433
15	23.600	54	4.625	93	1.244	132	0.422
16	22.530	55	4.456	94	1.207	133	0.412
17	21.510	56	4.294	95	1.171	134	0.401
18	20.540	57	4.139	96	1.136	135	0.391
19	19.630	58	3.990	97	1.103	136	0.382

Appendix 2: Resistance table for indoor/outdoor tube temperature sensor (20K)

Temp. (°C)	Resistance (kΩ)	Temp. (°C)	Resistance (kΩ)	Temp. (°C)	Resistance (kΩ)	Temp. (°C)	Resistance (kΩ)
-19	181.400	20	25.010	59	5.130	98	1.427
-18	171.400	21	23.900	60	4.948	99	1.386
-17	162.100	22	22.850	61	4.773	100	1.346
-16	153.300	23	21.850	62	4.605	101	1.307
-15	145.000	24	20.900	63	4.443	102	1.269
-14	137.200	25	20.000	64	4.289	103	1.233
-13	129.900	26	19.140	65	4.140	104	1.198
-12	123.000	27	18.130	66	3.993	105	1.164
-11	116.500	28	17.550	67	3.861	106	1.131
-10	110.300	29	16.800	68	3.729	107	1.099
-9	104.600	30	16.100	69	3.603	108	1.069
-8	99.130	31	15.430	70	3.481	109	1.039
-7	94.000	32	14.790	71	3.364	110	1.010
-6	89.170	33	14.180	72	3.252	111	0.983
-5	84.610	34	13.590	73	3.144	112	0.956
-4	80.310	35	13.040	74	3.040	113	0.930
-3	76.240	36	12.510	75	2.940	114	0.904
-2	72.410	37	12.000	76	2.844	115	0.880
-1	68.790	38	11.520	77	2.752	116	0.856
0	65.370	39	11.060	78	2.663	117	0.833
1	62.130	40	10.620	79	2.577	118	0.811
2	59.080	41	10.200	80	2.495	119	0.770
3	56.190	42	9.803	81	2.415	120	0.769
4	53.460	43	9.420	82	2.339	121	0.746
5	50.870	44	9.054	83	2.265	122	0.729
6	48.420	45	8.705	84	2.194	123	0.710
7	46.110	46	8.370	85	2.125	124	0.962
8	43.920	47	8.051	86	2.059	125	0.674
9	41.840	48	7.745	87	1.996	126	0.658
10	39.870	49	7.453	88	1.934	127	0.640
11	38.010	50	7.173	89	1.875	128	0.623
12	36.240	51	6.905	90	1.818	129	0.607
13	34.570	52	6.648	91	1.736	130	0.592
14	32.980	53	6.403	92	1.710	131	0.577
15	31.470	54	6.167	93	1.658	132	0.563
16	30.040	55	5.942	94	1.609	133	0.549
17	28.680	56	5.726	95	1.561	134	0.535
18	27.390	57	5.519	96	1.515	135	0.521
19	26.170	58	5.320	97	1.470	136	0.509

Note: The informations above are only for reference.

Appendix 3: form for indoor/outdoor unit's air exhaust temperature sensor numerical value of resistance

Temp. (°C)	Resistance (kΩ)	Temp. (°C)	Resistance (kΩ)	Temp. (°C)	Resistance (kΩ)	Temp. (°C)	Resistance (kΩ)
-29	853.500	10	98.000	49	18.340	88	4.754
-28	799.800	11	93.420	50	17.650	89	4.609
-27	750.000	12	89.070	51	16.990	90	4.469
-26	703.800	13	84.950	52	16.360	91	4.334
-25	660.800	14	81.050	53	15.750	92	4.204
-24	620.800	15	77.350	54	15.170	93	4.079
-23	580.600	16	73.830	55	14.620	94	3.958
-22	548.900	17	70.500	56	14.090	95	3.841
-21	519.600	18	67.340	57	13.580	96	3.728
-20	486.500	19	64.330	58	13.090	97	3.619
-19	458.300	20	61.480	59	12.620	98	3.514
-18	432.000	21	58.770	60	12.170	99	3.413
-17	407.400	22	56.190	61	11.740	100	3.315
-16	384.500	23	53.740	62	11.320	101	3.220
-15	362.900	24	51.410	63	10.930	102	3.129
-14	342.800	25	49.190	64	10.540	103	3.040
-13	323.900	26	47.080	65	10.180	104	2.955
-12	306.200	27	45.070	66	9.827	105	2.872
-11	289.600	28	43.160	67	9.489	106	2.792
-10	274.000	29	41.340	68	9.165	107	2.640
-9	259.300	30	39.610	69	8.854	108	2.568
-8	245.600	31	37.960	70	8.555	109	2.498
-7	232.600	32	36.380	71	8.268	110	2.431
-6	220.500	33	34.880	72	7.991	111	2.365
-5	209.000	34	33.450	73	7.726	112	2.302
-4	198.300	35	32.090	74	7.470	113	2.241
-3	199.100	36	30.790	75	7.224	114	2.182
-2	178.500	37	29.540	76	6.998	115	2.124
-1	169.500	38	28.360	77	6.761	116	2.065
0	161.000	39	27.230	78	6.542	117	2.069
1	153.000	40	26.150	79	6.331	118	2.015
2	145.400	41	25.110	80	6.129	119	1.963
3	138.300	42	24.130	81	5.933	120	1.912
4	131.500	43	23.190	82	5.746	121	1.863
5	125.100	44	22.290	83	5.565	122	1.816
6	119.100	45	21.430	84	5.390	123	1.770
7	113.400	46	20.600	85	5.222	124	1.725
8	108.000	47	19.810	86	5.060	125	1.682
9	102.800	48	19.060	87	4.904	126	1.640

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